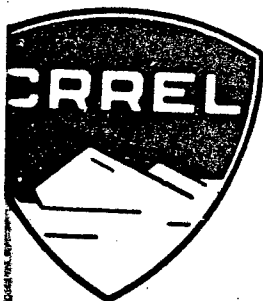


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**CRREL Report 12**  
**BIBLIOGRAPHY ON SNOW**  
**ICE AND PERMAFROST**  
**WITH ABSTRACTS**

**Volume XIX**

**JUNE 1965**

**U.S. ARMY MATERIEL COMMAND**  
**COLD REGIONS RESEARCH & ENGINEERING LABORATORY**  
**HANOVER, NEW HAMPSHIRE**

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## INTRODUCTION

The Bibliography on Snow, Ice and Permafrost with Abstracts, CRREL Report 12, was first published in 1951 and is a continuing project of the Cold Regions Bibliography Section in the Science and Technology Division of the Library of Congress. It is prepared for the Cold Regions Research and Engineering Laboratory (CRREL) of the U.S. Army Materiel Command, formerly U.S. Army Snow, Ice and Permafrost Research Establishment (SIPRE) of the Corps of Engineers. Volumes 1-15 were issued as SIPRE Report 12. Volumes 16, 17, and 18 were the first issues under the new title, CRREL Report 12. The present volume (Vol. 19) contains abstracts SIP 22001-23000.

The Bibliography provides USA CRREL with a current and comprehensive coverage of basic and applied scientific research on snow, ice, and permafrost, as well as living and working in polar regions and other cold areas.

Each entry includes a bibliographic citation, code designating the library holding of the abstracted item (see p. iv), assigned call number, Universal Decimal Classification number, and the abstract. This volume has a geographic index which was included as a forerunner to future editions contingent on the value derived. The abstracts were written by Calvin L. Clark, George A. Doumani, Benjamin L. Evans, Mary F. Guthrie, George D. Havas, Frank M. Marson, Sandra K. Moehring, Vladimir D. Pastuhov, Elizabeth Petrov, Eugenia Schilowsky, John F. Spletstoesser, Janet R. Turner, and Chang S. Tsai.

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The volume was prepared by Frank M. Marson, Supervisor, Benjamin L. Evans, Vladimir D. Pastuhov, Calvin L. Clark, Eugenia M. Henry and Alexandra David.

George A. Doumani, Head  
Cold Regions Bibliography Section  
Science and Technology Division  
Library of Congress

## LIBRARY SYMBOLS

- GRREL -- Cold Regions Research and Engineering Laboratory,  
Hanover, N. H.
- DDC -- Defense Documentation Center,  
Cameron Station, Alexandria, Va.
- DLC -- Library of Congress, Washington, D. C.
- OTS -- Department of Commerce, Clearinghouse for  
Federal Scientific and Technical Information,  
Springfield, Va.



# CRREL BIBLIOGRAPHY

SIP 22001

551.593.12:535(211)

Portman, Donald J., Edward Ryznar, Floyd C. Elder and Vincent E. Noble  
**VISUAL RESOLUTION AND OPTICAL SCINTILLATION OVER SNOW, ICE, AND FROZEN GROUND.** Res. Rept. 111, U. S. Army Cold Regions Research and Engineering Laboratory, 32p. incl. illus., tables, graphs, diagrs., March 1964. 24 refs.  
 CRREL files

Optical scintillation, visual resolution, and wind and temperature profiles were measured to determine relationships between scintillation and meteorological and surface conditions independent of time of day. Field experiments were based on the idea that empirical relationships among the temperature, wind, surface, and optical path parameters and measured scintillation would make it possible to estimate scintillation from ordinary meteorological and terrain information. Night observations avoided undesirable background light on the telephotometer and produced data for a wide range of stable thermal gradients. The snow cover was 0.5 m deep; the optical path was 1.5 m above the snow and 543 m long. Visual resolution was determined by viewing a Landolt broken-ring resolution chart through a 24-power telescope with a resolving power of 4 sec of arc. Results showed that for turbulent flow in stable stratification over snow, visual resolution deteriorated systematically as scintillation increased in intensity, and scintillation intensity increased with increase in vertical temperature gradient. Scintillation was at a minimum in the absence of thermal stratification and at a maximum during the sudden transition from laminar to turbulent flow, and increased with increase in wind speed. Scintillation power spectra for 8 periods revealed characteristics that could be related to visual resolution, the Richardson number, and the mean wind speed component normal to the optical path. (Authors' abstract)

SIP 22002

551.324:53

Camp, Paul R.  
**PROPERTIES OF ICE, PART II.** Res. Rept. 114, U. S. Army Cold Regions Research and Engineering Laboratory, 38p. incl. illus., graphs, diagrs., appendix A. Nov. 1963. 19 refs.  
 CRREL files

Equipment is described for growing ice crystals in different orientations to investigate relationship of quality to growth direction, and to test the effect of electric fields on nucleation of ice crystals. Experimentally measured values are compared with those theoretically calculated. The Lang photographic technique, the use of polarized X-rays, and the application of the theory of Zachariasen are discussed to show the degree of perfection of crystal and mosaic structure. Factors related to the thermal properties of the ice lattice deal with the

thermal motion of ice molecules, temperature variations of the a and c parameters, and comparison of the behavior of bulk coefficients of expansion and lattice parameters. Dielectric relaxation and conductivity in ice are discussed in terms of temperature, activation energy of formation, and impurities present. The introduction of NH<sub>4</sub>F as a substitutional impurity in the lattice altered the dielectric properties by introducing Bjerrum defects. Experiments producing Bjerrum defects optically, resulted in the pulse process absorption of longer wavelengths, and the step process absorption of shorter wavelengths and bulk heating. Long period dielectric effects were divided into two types, one which dominates the first 3 to 30 sec. of condenser discharge, and another which determines the long time behavior. (See SIP 19998) (Author's abstract)

SIP 22003

551.578.46:539.3:532.1

Napadensky, H.  
**DYNAMIC RESPONSE OF SNOW TO HIGH RATES OF LOADING.** Res. Rept. 119, U. S. Army Cold Regions Research and Engineering Laboratory, 25p. incl. tables, graphs, diagrs., March 1964. 12 refs.  
 CRREL files

An experimental investigation of stress-wave propagation in snow and ice is described. Seven types of Greenland snow were investigated to determine the extent to which the variation in dynamic response of the snow is a function of snow types, and were compared with results of similar Michigan snow experiments. A low-density explosive charge was detonated, sending a steep-fronted shock wave through a metal transfer plate and into the snow sample, compressing the snow and setting it in motion. Measurements were made on shock waves with amplitudes of less than 200 atm. Density and pressure behind the wave fronts were determined by simultaneous measurement of wave-propagation and particle velocity as limited by the fast elastic wave and the slower plastic wave of the two-front structure. Values calculated by the Rankine-Hugoniot jump conditions determined the points at which the material behaves plastically or hydrodynamically. The maximum stable pressure-volume states that snow can reach under shock loading are also shown. Sources of scatter in the results from variations in snow type and errors in data reduction and geometry changes are pointed out. (Author's abstract)

SIP 22004

551.331:539.386

Jwizow, George K.  
**INVESTIGATION OF SHEAR ZONES IN THE ICE CAP MARGIN THULE, GREENLAND.** Res. Rept. 93, U. S. Army Cold Regions Research and Engineering Laboratory, 18p. incl. illus., tables, graphs, diagrs., Feb. 1964. 9 refs.  
 CRREL files

# CRREL BIBLIOGRAPHY

The shear moraine phenomenon of glaciers is examined in the light of new evidence collected in the general Tuto area during 1958-1959. The formation and composition of silt bands, some heavy accumulations of boulders and gravel, and streaks of clayey ice exposed during the excavation of two ice tunnels in the margin of the ice cap are described in detail. Surface investigations have furnished information on the location and concentration of the glacial ice-snowdrift ice interface, variations of silt, sand, and rock lands, and other materials produced by the shear surfaces. A general view of the outcropping shear moraines shows a tendency toward a broad arch-shaped pattern, perpendicular to the direction of flow and, in most cases, parallel to the ice edge. The distance from the ice edge varies from a few dozen feet at the ice cliffs to a half mile and more. Motion measurement between two ice levels is presented in the form of limiting angles on a velocity distribution curve. The indication of great variability in conditions at the edge of the moving ice is discussed in terms of contact zone between the glacier bottom and ground surface, nature of interaction occurring in zones containing glacier-ground surface interface, and mechanics of the migration of inclusion bands which occur during the formation of glacial shear moraines. (Author's abstract)

SIP 22005

551.491.814:551.345(\*49)

Waller, Roger M.  
WINTER HYDROLOGY OF A SMALL ARCTIC  
STREAM. p. 134-136. (In: Proc. 12th Alaskan  
Sci. Conf., Aug. 28-Sept. 1, 1961, College,  
Alaska).  
DLC, Q180.U5A66

Observations of the hydrologic regime of Ogotoruk Creek near Cape Thompson in northwest Alaska were made to determine the occurrence of water beneath the stream bed during the winter. The basis of the investigation was to determine whether the floodplain deposits (which are 15 ft thick) become completely frozen to bedrock, or to the top of the permafrost. In its lower reach, the creek has a small flood plain in a broad valley. Permafrost occurs beneath the tundra and in the bedrock to depths of more than 1000 ft. The creek begins flowing in early May from snowmelt, which gradually thaws the seasonal frost developed in the stream bed. As winter sets in, seasonable frost begins to grow downward, and the creek freezes over. Ground water stored in the thawed reaches of the stream bed and the adjacent flood-plain drains out to sea. Insulating snow cover may retard the growth of seasonal frost downward and permit the remaining creek water and the subsurface water to drain out at a normal rate. It is concluded that an arctic stream that has a thickness of coarse deposits exceeding seasonal frost penetration and a gentle gradient should retain an unfrozen ground-water zone throughout the winter if the previous year's flow were normal. -- BLE

SIP 22006

551.491.83:628.11(\*3)

Walker, H. J.  
WINTER WATER SOURCES IN THE AMERICAN  
ARCTIC. p. 136-144. (In: Proc. 12th Alaskan  
Sci. Conf., Aug. 28-Sept. 1, 1961, College,  
Alaska). 8 refs.  
DLC, Q180.U5A66

Sources of potable water and methods of processing it from snow and ice are discussed. During the summer, water is available from rivers, lakes, and ponds, most of which depend on the melting of snow and ice that cover the land during the cold season. Winter availability of water from beneath freshwater ice is much more limited than a map of lake distribution would suggest. Many lakes cannot provide adequate storage for a community of more than a few people, and many stations have to haul water for over 5 mi. Snow is a reliable water source for several months of the year. Ice is preferred to snow because of its higher density and its ability to conduct heat more rapidly. Methods which have been used to supply water include hauling it in trucks or in tanks enclosed in a heated wannigan, sawing lake ice into blocks and hauling it to the melters, filling large, heated, storage tanks in summer for winter use, and the packaging of water. In the operation of the DEW line, crusher-elevator units are built into the ends of the modules and used extensively during the winter at 25% of the stations. -- BLE

SIP 22007

551.465.71(\*60)

Vowinkel, E. and Bea Taylor  
EVAPORATION AND SENSIBLE HEAT FLUX OVER  
THE ARCTIC OCEAN. Publ. in Meteorology No. 68,  
Sci. Rept. No. 10, Contract AF 19(604)-7415,  
McGill Univ., 30p. incl. graphs, map, March  
1964. 27 refs. (AFCR 64-272)  
DLC, GPRR

Evaporation and sensible heat flux have been calculated for each month over the Polar Ocean and the Norwegian-Barents Sea. Sverdrup's evaporation formula was used, and the dependence of the K-coefficient in that formula on wind speed frequency distribution was examined. Previously obtained surface temperatures were used, but additional examinations for extreme surface temperatures in summer and winter. Evaporation and sensible heat flux were calculated separately for the following areas: Central Polar Ocean, Kara-Laptev Sea, East Siberian Sea, Beaufort Sea, and belts of 5° latitude of the Norwegian-Barents Sea. Evaporation over ice surfaces has a double maximum in spring and fall, and a main minimum in winter. Over open water surfaces the evaporation shows a summer minimum and a broad maximum in winter. The Shuleikin formula was used over the Polar Ocean. This permits the determination of sensible heat flux independent of evaporation. The sensible heat flux curves are similar to the

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evaporation curves. Open water areas in the Polar Ocean show very high values for sensible heat flux. One per cent open water, from Oct. to May, would increase the heat flux from the Central Polar Ocean from 3.7 to 5.2 Kcal/cm<sup>2</sup>/yr. Open areas must remain small because there is not enough energy available to maintain such fluxes. Monthly values of the total heat loss by evaporation and sensible heat flux for the various areas are tabulated. (Authors' abstract, modified)

SIP 22008 551.578.7:551.508.55

Atlas, David and Kenneth R. Hardy  
RADAR REFLECTIVITY OF STORMS CONTAINING SPONGY HAIL. *J. Geophys. Res.* 69(10):1955-1961 incl. table, graphs, May 15, 1964. 24 refs.  
DLC, QC811.J8

Experimental measurements at 5-cm wavelength show that the backscattering cross sections of ice spheres 2 cm in diam. which are coated with a mixture of water and ice ("spongy" coating) are 3 to 4 db above that of the equivalent all-water spheres and at least 10 db above that of the equivalent solid ice spheres. Thus it is shown that the extremely large reflectivity factor at 3-cm wavelength ( $Z_e = 10^7$  mm<sup>6</sup>/m<sup>3</sup>) observed for hailstones can be accounted for with concentrations of 3 g/m<sup>3</sup> of hailstones 1 cm in diam. which have a spongy coating. Both the falling away of the spongy coating upon melting and its freezing upon being lifted in the updraft will cause reductions in reflectivity, thereby producing the maximum reflectivity observed at an intermediate level of the storm. The existence of spongy ice allows the surface and radar observations of hailstorms to be explained without any of the physically implausible assumptions of previous hypotheses. (Authors' abstract)

SIP 22009 550.385:550.37(\*60)  
551.328.62(\*60)

Swift, Daniel W. and Victor P. Hessler  
A COMPARISON OF TELLURIC CURRENT AND MAGNETIC FIELD OBSERVATIONS IN THE ARCTIC OCEAN. *J. Geophys. Res.* 69(9):1883-1893 incl. table, graphs, map, May 1, 1964. 4 refs.  
DLC, QC811.J8

Simultaneous observations of the H and D components of the magnetic field and of 2 components of telluric current were made on Arctic drifting station Charlie during the winter of 1959-1960, and on station Arlis I in early 1961. The telluric current and magnetometer data show a striking similarity. Spectral analysis showed the 2 types of data to have a similar spectral characteristic. The ratio of magnetic to electric fields was computed by Price's theory. It was found that the theory and experimental results agree well with the data taken from station Charlie,

which is located over a basin to the west of Chukchi rise. It was also found that the data on Arlis I, on the eastern edge of the Chukchi rise, was considerably influenced by the deeper water to the east in the Canadian basin and Beaufort Sea. (Authors' abstract)

SIP 22010 624.139.2:551.345:551.586

Shvetsov, Peter  
LIVING AND WORKING ON THE FROZEN GROUND OF THE ARCTIC. *New Scientist*, 20(371):774-775 incl. illus., Dec. 1963.  
DLC, Unbound periodical

This paper discusses the effect of permafrost on air temperature, the significance of permafrost as an environment for plant development, and the problem of construction and mining in permafrost regions. Freezing of the deep subsoil causes severe climatic conditions, and during the summer months the relative humidity in the air and soil rises. Low average annual air temperatures (below -10°C) and permafrost temperatures (-3°C), however, do not eliminate the possibility of a very productive development of ordinary forests and grasses, including cereals. The chief method of ensuring stability of ordinary (not "hot") buildings and other structures is to reduce heat penetration into the active soil layer, increase heat losses from the ground, and minimize the depth of thawing. Excavation and exploitation of mines in icy silty-loam soils, sandy-loam, and sand, are easier if the permafrost remains frozen during excavation. However, this does not oppose the expedience of thawing the permafrost with steam, electricity, or heat of natural origin. -- BLE

SIP 22011 551.574.7:629.135

Kravchenko, I. V.  
AIRCRAFT ICING. (Obledeniye samoletov; Text in Russian). p. 265-291 incl. illus., tables, graphs, diagrs. (In: *Leichba o meteorologii*, Moscow, Voennoe Izdat. Ministerstva Oborony SSSR, 1962). (Eng. transl.: *Meteorology and the Pilot*. Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, FTD-TT 63-620/1-3)  
DLC, TL556.K73

The causes and effects of icing on the aerodynamic characteristics of airplanes and helicopters in flight and on the ground are discussed, and methods to combat icing are given. The various forms of ice formation, rate of icing, and determining factors are examined; and meteorological conditions under which icing occurs are described. Aircraft icing can be avoided at certain flight speeds as a result of heating caused by the internal friction of air particles against the aircraft surface (kinetic heating). The greatest probability of icing is encountered in

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supercooled clouds which have a large vertical temperature gradient. Such conditions may prevail during the formation of cumulonimbus clouds and in nimbostratus clouds developing along clearly defined fronts. Helicopter icing is most dangerous on the lifting and tail propellers. This icing can be prevented by centrifugal force when its magnitude is greater than the force of ice adhesion to the blade surface. -- BLE

SIP 22017 551.462:550.382(\*60)

Ostenso, Ned A.  
AEROMAGNETIC SURVEY OF THE ARCTIC OCEAN BASIN. p. 115-148 incl. graphs, maps. (In: Proc. 13th Alaskan Sci. Conf., April 1963, College, Alaska). 35 refs.  
DLC, Q180.U5A66

An aeromagnetic survey (49,500 km of flight lines) was conducted over the Arctic Ocean during May and June, 1961. A P2V-5 (Neptune) aircraft was instrumented with a Varian proton precession magnetometer (Model 4910) capable of recording the absolute value of the earth's total magnetic field to a sensitivity of  $\pm 4$  gammas. An APN-122 doppler navigator was used to obtain true ground speed and drift. The data, which were reduced and analyzed by computer, are given on the frequency of depths determined from magnetic anomalies originating from deep and shallow sources, residual magnetic profiles, seismic crustal sections in the Arctic Ocean, and the total intensity of the earth's magnetic force. Particular attention is given to magnetic activity in the Franklin geosyncline area, the Sverdrup Basin, the Canadian Arctic Archipelago, Hakkel's staircase region, the Chukchi Shelf, the Alpha Ridge, the Makarov Deep, the Lomonosov Ridge, the Nansen Basin, and North Greenland and environs. A regional magnetic chart of isodynamic contours shows that the regional gradient observed in 1961 is much less than that shown on the Hydrographic Office Chart. The highest value observed over the north magnetic pole is 58,750 gammas with an S-shaped flexure over the Robeson Channel. This deflection occurs over the proposed continuation of Caledonian folding and associated basaltic intrusions from northern Greenland to northern Ellesmere Island. -- BLE/GAD

SIP 22013 551.594.5:771.3

Kulkarni, P. V.  
AN ALL-SKY PHOTOMETER. Nature, 196(4852): 363-364 incl. tables, graph, Oct. 27, 1962. 3 refs.  
DLC, Q1.N2

This is a description of a simple photoelectric type of photometer to be used for measuring the intensities of the night airglow radiations emitted from the whole dome of the sky, during the period of the International Quiet Sun Year. The basic objective is to

provide an index of the airglow intensity at specific wavelengths. The instrument will be operated on all clear, moonless nights to obtain the hourly or half-hourly "airglow index" for the station. The all-sky photometer basically differs from the conventional airglow photometer in that the former measures the intensities up to  $80^\circ$  zenith angle and at all azimuths, while the latter usually covers a narrow angle and hence has to scan the sky to obtain complete information. A diagram, showing a sample record obtained with the all-sky photometer, is included. (Author's abstract)

SIP 22014 551.594.51:551.510.535

Axford, W. I. and C. O. Hines  
ON THE THINNESS AND ORIENTATION OF AURO-  
RAL ARCS. J. Geophys. Res. 67(5):2057-2058 incl.  
diagr., May 1962. 2 refs.  
DLC, QC811.J6

Various features of auroral production and morphology are related to other high latitude geophysical phenomena which can be explained quantitatively and qualitatively. The process on which the new theory is based is explained and shown by a figure. It is based on circulation of magnetospheric ionization in two gigantic convective loops penetrating down to ionospheric levels and thus producing a pattern of movement similar to Davis' observations (1960). The theory states that irregularities are generated near the outer boundary of the magnetosphere which is magnetically linked to the sunward side of the Earth at high latitudes. -- Meteorological & Geostrophys. Abstracts

SIP 22015 550.312(\*7)

Artem'ev, M. E.  
APPROXIMATE CALCULATION OF THE ISOSTATIC  
ADJUSTMENT AND THE ISOSTATIC STATE OF  
ANTARCTICA. (O priblizhennom uchete izostati-  
cheskoj popravki i ob izostaticheskom sostoianii  
Antarktidy; Text in Russian). Akad. nauk SSSR Izv.  
Ser. Geofiz. No. 2:345-346, 1963. 7 refs.  
DLC, Slavic Div.

The size of the isostatic correction is unrelated or only remotely related to the average elevation of large parts of the earth's crust. However, the size does depend on the deviation of individual elements of the relief from the average elevation of the region. It is shown that the use of Andreev's graphs indicating the relationship of the isostatic correction to elevation can lead to errors. The conclusion regarding intensive negative isostatic anomalies in the Antarctic is substantiated. -- Geophys. Abstracts

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SIP 22016 591.94: (\*764)  
551.324.28:551.324.43: (\*764)

Holdgate, M. W.  
FAUNAL REMAINS ON THE ROSS ICE SHELF IN  
McMURDO SOUND. Polar Rec. 11(70):40-42, Jan.  
1962. 14 refs.  
DLC, G575. P6

Over the years many specimens of Notothentid fishes, pelecypods, gasteropods, brachiopods, siliceous sponges and anthozoan corals have been found on the surface of the ice shelf in McMurdo Sound near the Dailey Islands. Some of the larger fish specimens were found to be 1,100 yr old. The problem is to account for their presence on the surface of an ice shelf some 120 ft thick, floating over waters probably 90 fathoms deep. Denham has outlined a possible mechanism, pointing out that on the McMurdo Sound part of the Ross Ice Shelf, surface ablation exceeds precipitation, although the thickness of the ice remains nearly uniform. It is suggested that the uniform thickness would be maintained by the addition of ice from below, and that the sea-bottom muds, sessile invertebrates and fishes become incorporated into the ice shelf by being frozen in shallow places where new ice links the ice sheet to the sea bed in winter. Several consequences of this hypothesis, as yet unconfirmed, are: (1) the ice shelf in this area must be moving rather slowly (approx. 50 yds/yr); (2) the average upward movement of the faunal material must be only 1-3 in./yr; and (3) the lower Kestilitz Glacier must be practically stationary. -- JRT

SIP 22017 664.41:551.325.7: (\*764)

Wellman, H. W. and A. T. Wilson  
SALTS ON SEA ICE IN McMURDO SOUND, ANTARCTICA. Nature, 200(4905):462-463, Nov. 2, 1963. 6 refs.  
DLC, Q1.N2

Extensive deposits of salts were found on the surface of sea ice near the coast of Hut Point Peninsula in Nov. 1962. The salts form long rows 30 ft or so wide, and rest on sea ice 4-10 ft thick, which breaks out in late summer and refreezes in the following winter. The salts consist of hydrated sodium sulfate with a small admixture of calcium carbonate and sodium chloride. The mineralogical form of the sodium sulfate is uncertain. The most likely source of the salts is by freezing and concentrating sea water as it percolated through the cold compacted snow of the Ross Ice Shelf. -- GAD

SIP 22018 551.326.2: (\*764)

Gunn, Bernard M.  
FLOATING GLACIER TONGUE FROM MOUNT  
EREBUS. J. Glaciol. 4(33):828 incl. illus., Oct.  
1963. (Correspondence)  
DLC, GB2401. J8

The author presents a photograph of the floating glacier tongue which extends out into McMurdo Sound from the slopes of Mount Erebus. Lateral spurs and re-entrants are well indicated. It is suggested that these spurs formed when a glacier stream in which the ice has been flowing more rapidly at the center than at the sides enters the sea, and, freed from the restraining contact with the bottom, commences to move at a uniform rate. -- JRT

SIP 22019 551.578.8:543:549: (\*746)

Matveev, A. A.  
DYNAMICS OF THE CHEMICAL COMPOSITION OF  
ATMOSPHERIC PRECIPITATION IN THE PRAVDA  
COAST REGION, ANTARCTICA. (Dinamika  
khimicheskogo sostava atmosferykh osadkov v  
raione berega pravdy (Antarktida): Text in Russian).  
Doklady Akad. nauk SSSR, 146(2):450-452 incl.  
table, 1962. 2 refs.  
DLC, AS262. S3663

The Third Soviet Continental Expedition collected 80 samples of atmospheric precipitation to determine the chemical composition of hydrometeors at Mirnyy and Oasis Stations. General geochemical characteristic of all samples included an average mineralization of 5-20 mg/l in about 60%, and 20-50 mg/l in 26% of the samples. Minimum mineralization of 3.27 mg/l was recorded in June when open water was most distant from Mirnyy. The most frequent high mineralization of about 100 mg/l was observed in Feb. when Davis Sea was free of ice. Analysis of ice and snow along the 100 m shore zone at Mirnyy showed a mineralization of 6.91-21.72 mg/l. Moraine lakes in region Mirnyy-3 contained the highest amount of soluble salts, 21.72 mg/l during the summer. Thus, during the short Antarctic summer, shore rocks are subjected to the active influence of snow, ice, and slope winds, the evidence of which is shown in the increased mineralization of water in rock ponds and appearance of carbonate spots on rocks. Change in mineralization of atmospheric precipitation at various stages of air mass crossings is tabulated. (See also SIP 21565) -- EP: FMM

SIP 22020 5.001: (\*7)

Cromie, William J.  
SECRETS FROM COLD STORAGE. Nat. Hist. 72  
(8):20-27 incl. illus., Oct. 1963.  
DLC, QH1. N13

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The two ice sheets of Greenland and Antarctica are remains of ice covers which retreated from much of the globe about 11,000 years ago. The study of ice in the polar regions is important in the consideration of current meteorology, historical geology, and the world's geographic and economic future. These studies comprise several methods which can be applied to snow pit walls and ice cores. Measurements of density and grain size yield information on changes in climates in the past, while temperature measurements reveal how the weather is changing today. Ash layers from volcanic eruptions, and isotopes of hydrogen, carbon and oxygen provide means of dating the ice, and data on past climates. In addition, seismic work has shown an average ice thickness in Antarctica of 6500-8000 ft. Should the ice in Antarctica melt, sea level would rise about 130 ft, allowing for earth crust stabilization. Melting of the Arctic Ocean ice would affect northern shipping routes and precipitation. -- JFS

SIP 22021

551.578.46:551.521  
551.311.1:551.521

Loewe, F.

ON THE RADIATION ECONOMY, PARTICULARLY IN ICE- AND SNOW-COVERED REGIONS. Gerlands Beitr. Geophysik, 72(6):371-376 incl. tables, 1963. 15 refs.

DLC. QC801. B3

Compared with single reflection, multiple reflection increases the absorption of short-wave radiation by the atmosphere and the ground, and reduces the combined reflection of air, cloud, and ground. The effect is particularly strong when ground albedo is high, cloudiness is strong, and water vapor content of the air is small. Data are presented in this paper which indicate that the distribution of the radiative energy is less modified by multiple reflection, than earlier, cruder treatments suggested. (Author's abstract, modified)

SIP 22022

551.326.62:551.33(\*3)

Smith, David D.

ICE LITHOLOGIES AND STRUCTURE OF ICE ISLAND ARLIS II. J. Glaciology, 5(37):17-38 incl. illus., table, diagr., maps, Feb. 1964. 52 refs. DLC. GB2401. J68

Ice Island ARLIS II, which is adrift in the Arctic Ocean, is a fragment of shelf ice 12-25 m thick, 1.3 km wide and 3.8 km long, which preserves several structural features heretofore undescribed in ice. The island is composed of an irregular central block of foliated, locally debris-rich, grey glacial ice bordered in part by extensive areas of stratified bluish sea ice. The central block contains a series of narrow, elongate, subparallel dike-like septa of massive fresh-water ice and a large tongue-like body of tightly folded, coarse banded ice. Both the septa and the tongue cut across the foliation and debris

zones of the grey ice. The margins of the central block are penetrated by a series of elongate, crude wedge-shaped re-entrants occupied by salients of bluish sea-ice. Two broad, arch-like plunging anticlines deform the stratified sea ice along one margin of the block. The foliation and debris zones in the glacial ice are relict features inherited from the source glacier. The septa formed as crevasse and basal fracture fills. Salients represent fills formed in the irregular re-entrants along the margins of the glacial ice mass. The tongue of tightly folded, banded ice represents an earlier generation salient deformed by compressive forces as the fill built up. The broad anticlines are apparently the result of warping in response to differential ablation but the small, tight plunging folds on their noses and limbs are probably the result of compressive forces. (Author's abstract)

SIP 22023

551.324.28:622.14(\*3)

Ragle, R. H., R. G. Blair and L. E. Persson  
ICE CORE STUDIES OF WARD HUNT ICE SHELF, 1960. J. Glaciology, 5(37):39-59 incl. illus., tables, graphs, map, Feb. 1964. 15 refs. DLC. GB2401. J68

Ice cores were taken from each of the 3 physiographic features (the floating shelf, grounded ice rises, and a re-entrant) and thermal profiles were recorded from each hole for the study of sub-surface morphology and thermal history. Laboratory analyses included stratigraphic, petrologic, chemical, and physical methods. Two cores taken from the Marknam Bay re-entrant showed it to be 11 m thick. Four distinct types of texture were identified in the cores: glacier, lake, sea, and transition ice. The re-entrant core consisted of an upper zone of transition ice and the rest of sea ice. Observations in natural and plane polarized light revealed a genetic relationship between texture and ice type. Glacier ice is clear to bubbly, exhibiting a variety of structures and a constant texture. Lake ice has a medium to very coarse grain texture. Most sea ice, viewed in natural light, is cloudy and homogeneous. The cloudiness is caused by bubbles less than 500  $\mu$ ; the homogeneity results from infrequent fluctuations at the interface of the physical and chemical environment of growing saline crystals. Transition ice has the characteristics of the 3 other types and is believed to be the buried former edge of the ice shelf. Other structures found within the ice types are fractures and faults, dirt layers, brine pockets, vapor figures, and micropolygons. Chlorine and sulphate analyses were made to determine the quantity of these salts present. Densities were computed in the field from weight and volume measurements, and the difference in dielectric constant suggests the possibility of detecting the glacier ice-sea ice interface by the reflections of electromagnetic waves. -- BLE

# CKREL BIBLIOGRAPHY

SIP 22024

551.324.4:551.324.54(\*49)

Heusser, Calvin J. and Melvin G. Marcus  
SURFACE MOVEMENT, HYDROLOGICAL CHANGE  
AND EQUILIBRIUM FLOW ON LEMON CREEK GLA-  
CIER, ALASKA. J. Glaciology, 5(37):61-75 incl.  
illus., tables, diagrs., maps, Feb. 1964. 14 refs.  
DLC, GB2401.J68

Results are presented of studies during the IGY to discuss the 1953-1958 hydrological budgets, and to test Nielsen's equations for the equilibrium glacier using 1957 and 1958 movement and hydrological data. Lemon Creek Glacier represented one of the glaciological stations in the North American network. Each budget year for the period studied shows a deficit, except 1954-1955 which registered a pronounced surplus. The net deficit amounts to  $10.32 \times 10^6 \text{ m}^3$  of water. The 1956-1957 budget was only slightly negative ( $0.82 \times 10^6 \text{ m}^3$ ) but that for 1957-1958 was strongly negative ( $8.96 \times 10^6 \text{ m}^3$ ). Surface flow measurements provide a more accurate and realistic picture of glacier flow than is normally available from short summer surveys. The glacier appears to be close to equilibrium and to behave in the manner predicted by Nielsen's theory of equilibrium flow. (Authors' abstract, modified)

SIP 22025

551.326.7:620.172(712.2)

Langleben, M. P. and E. R. Pounder  
ARCTIC SEA ICE OF VARIOUS AGES. I. ULTI-  
MATE STRENGTH. J. Glaciology, 5(37):93-98 incl.  
tables, graphs, diagr., Feb. 1964. 8 refs.  
DLC, GB2401.J68

A comparison of polar ice (several years old) with biennial ice (1-2 yr old) was made between mid-April and mid-May 1962, in the vicinity of Isachsen, Ellef Ringnes Island, N.W.T. (79°N, 104°W). Supporting measurements were made of salinity, density, and crystal structure. The ultimate strength was determined by using the ring tensile test. The application of this test to ice mechanics originated with the introduction of the SIPRE coring auger. A core 3 in. in diam. was extracted from the ice sheet. It was sectioned into samples 3 in. long, and a 0.5 in. diam. hole was drilled along the axis of each sample. The sample was placed in a screw-jack type of press with its axis horizontal and with its direction of load application perpendicular to the sample axis. Upon breakage, the sample fragments (usually in the form of 2 half-cylinders) were put into a sealed container and set aside for later determinations. Eighty-seven samples of biennial ice and 132 of polar ice, all from vertical cores, were tested. About 20 cores were extracted at depths of 67 and 86 cm. Cores stressed during coring exhibited a difference of strength of 22% in comparison with unstressed cores. Tensile strength values averaged 6% higher for the polar ice and 21% higher for the biennial ice than values for annual sea ice. Analysis of the horizontal cores from biennial ice gave inconclusive results.  
-- BLE

SIP 22026

551.326.7:539.32(712.2)

Pounder, E. R. and M. P. Langleben  
ARCTIC SEA ICE OF VARIOUS AGES. II. ELASTIC  
PROPERTIES. J. Glaciology, 5(37):99-105 incl.  
tables, graphs, Feb. 1964. 8 refs.  
DLC, GB2401.J68

Observations were made in April and May, 1962 at 78°42'N, 104°06'W near Isachsen, Ellef Ringnes Island, N.W.T. Polar ice (more than 2 yr old) and biennial ice (which started to form in the fall of 1960) were tested. Young's modulus E and Poisson's ratio were calculated for biennial and polar ice from P-wave velocities in small samples and from a study of the resonant frequencies of the same samples. P- and S-wave velocities in the biennial ice cover were found by a seismic method. Most cores were extracted with a SIPRE auger. Barium titanate transducers were attached to both ends of the sample and the input transducer was excited with repetitive pulses having a sharp leading edge. The transit time for pulse was measured by comparing it with a calibrated time delay in the DuMont Type 326 generator which supplied triggers for both the input pulse to the ice and the sweep for the cathode ray oscilloscope on which the received pulse was displayed. The equation for the bulk velocity involves both Young's modulus E and Poisson's ratio; therefore, 2 separate measurements are needed. Resonant frequencies were measured for eight ice samples from vertical cores of polar ice and both vertical and horizontal cores of biennial ice. Supporting observations (salinity, density profiles, and crystal structure) were made in the usual way. The small-scale tests showed no significant differences between the 2 ice types tested. Young's modulus averaged 3.6% lower than the comparable figure for annual sea ice. The seismic method gave values 20% lower than the small-scale tests. -- BLE

SIP 22027

551.44(\*49)

Clayton, Lee  
KARST TOPOGRAPHY ON STAGNANT GLACIERS.  
J. Glaciology, 5(37):107-112 incl. illus., table,  
map, Feb. 1964. 7 refs.  
DLC, GB2401.J68

Conditions necessary for the formation of glacial karst are given, karst features on the Martin River Glacier, Alaska, are described, and the glacial karst cycle is outlined. For the formation of karst there must be soluble, dense, highly jointed rocks (glacial ice in this case), a low ground-water base level, and at least moderate rainfall. In addition, the glacier must be stagnant and drift covered. The most striking karst features on the Martin River Glacier are funnel-shaped sink-holes (60-370 m in diam. and as many as 30/km<sup>2</sup>). Other features present are the shaft-like sink-hole or moulin (the

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result of solution alone rather than collapse), ice caves and tunnels (over 3 m high and 2 km long), sinking streams, dry stream beds, blind valleys, large springs, natural bridges, lapies, hums, and ablation till. The glacial karst cycle is essentially the same as the limestone karst cycle. Glacial karst is rare today, but it was widespread on stagnant glaciers in areas such as the northern Great Plains of North America in late Wisconsin time. -- BLE

SIP 22028

551.321.2:622.234.2

Shreve, R. L. and W. B. Kamb  
INSTRUMENTS AND METHODS. PORTABLE  
THERMAL CORE DRILL FOR TEMPERATE GLACIERS. *J. Glaciology*, 5(37):113-117 incl. illus.,  
diagr., Feb. 1964. 10 refs.  
DLC, GB2401.J68

In the summer of 1962, a completely portable and relatively simple electrically heated thermal core drill of new design was constructed and used to obtain 16 oriented samples of ice 2.5 cm in diam. by 120 cm in length from depths ranging from 12 m to 137 m in lower Blue Glacier, Mount Olympus, Washington. The thermal element is a 0.260-in. diam. 300-W 150-V tubular heater bent to form an annulus with an external diameter of 5.0 cm. Opposed ratchet-like teeth break off and hold the core inside the tubular core barrel. Orientation is recorded photographically by a commercial inclinometer modified to show azimuth and to be controlled from the surface. Most of the cores were elliptical in cross section, and showed irregular variations in diameter. Many were broken into 2, 3, or 4 pieces, which could be fitted together. It is possible that cores brought suddenly from depth in a glacier will break spontaneously regardless of how gently they are handled; therefore, no change in equipment or procedure would be entirely successful. (Authors' abstract, modified)

SIP 22029

551.351/.353:622.14(\*7)

Ericson, David B., Maurice Ewing and Goesta Wollin  
SEDIMENT CORES FROM THE ARCTIC AND SUB-ARCTIC SEAS. *Science*, 144(3623):1183-1192 incl. illus., table, graphs, maps, June 5, 1964. 26 refs.  
DLC, Q1.S35

Sediment cores (58 from the Arctic Ocean and 26 from the Greenland and Norwegian Seas) raised during drifting expeditions between the early 1950's and 1962 were analyzed at the Lamont Geological Observatory. Four types of sediments occur in the cores: (1) lutite, which has accumulated through the slow but continuous settling of mineral particles derived from the continents and hard parts of microscopic floating organisms. (2) rock detritus transported from land by drifting ice. (3) sediment transported from shallower water by turbidity currents, and (4) mineral particles and particles of volcanic eruptions.

The positions of the coring stations are shown, and the locations, water depths, and core lengths are tabulated. Among the topics discussed are the distribution of planktonic organisms and the climatic record. The cores from the Norwegian and Greenland seas demonstrate the essential similarity between depositional processes in those areas and in the Atlantic. The fluctuations in numbers of tests of *Globigerina pachyderma* in cores from the Arctic Ocean indicate a climatically controlled variation in the thickness and continuity of the ice cover. The coiling direction in this species indicates that a northward shift of the 7.2°C isotherm took place at the end of the last ice age, and that the isotherm has never extended into the Norwegian Sea during the last 70,000 yr. The net movement of floating ice was from north to south in the eastern half of the Norwegian Sea, in contrast to the south-to-north current now flowing there. -- BLE

SIP 22030

612.592

Veghte, James H.  
EFFECTS OF PARTIAL COLD WATER IMMERSION ON MAN IN THE ARCTIC. Tech. Document Rept. 63-24, Arctic Aeromedical Lab., 11p., incl. illus., table, graphs, June 1963. 4 refs.  
ASTIA, AD 419817

Experiments were conducted to determine how critical a hazard to man partial cold water immersion would be during the Arctic winter and how long a time would be available before frostbite could be expected. At ambient temperatures (from -20°F to -45°F), the subject's right leg was immersed to the knee in water for 10 sec., after which the subject either stood at rest or exercised. Twenty-four skin temperature measurements were recorded every 2 minutes, and experiments were terminated when skin temperature reached 40°F. Data indicate that footgear should not be removed after accidental partial cold water immersion and that, even with no activity, a person has approximately 30 min. before any danger of frostbite occurs. Exercising or walking greatly prolongs tolerance time and, even at very low temperatures, one may walk for hours before the foot temperature becomes dangerously low. (Author's abstract)

SIP 22031

551.324+.326:551.33:528.7(\*735)

Kusunoki, Kou and Nobuo Ono  
ICE CONDITIONS IN LUTZOW-HOLM BAY, ANT-ARCTICA, 1956-59, PRESENTED ON THE BASIS OF PHOTO-INTERPRETATION. *Contrib. Inst. Low Temp. Sci. (Sapporo, Japan)*, Ser. A, No. 19, 21p., incl. illus., table, graph, maps, 1964. 21 refs.  
DLC, Orientalia Div.



# CRREL BIBLIOGRAPHY

The paper discusses the physiographic nature of the surface of continental and sea ice, and the features of the exposed rock in the littoral area of Lützow-Holm Bay. Airphotos of both the land and sea areas show ablation phenomena resulting from the intense solar radiation and relatively high air temperatures of this region. The photos also give evidence of continued active glacial flow and the existence of many coastal outlets. Paired airphotos covering the same areas in different years are used for a comparative study of the long-term changes in ice conditions, such as the flow rate of channel glaciers and the decay of ice tongues. Shipboard observations and airphotos show shallow banks unfavorable for navigation, pressure ridges in the pack ice, and meltwater pools on the fast ice which prevent surface transportation. -- FMM

are unsuccessful if ice obeys a flow law of the form of  $\dot{\epsilon} = k\tau^n$ , with a value of  $n$  between 1 and 5, and if this law can be applied to the shear stress produced in each glide direction to give corresponding shear strain rate. The deformation of polycrystalline ice depends on the shape of the individual crystals. Specimens taken from thin layers of ice formed by freezing water consist of columnar ice crystals with all their optic axes parallel and behave like single crystals. Ice formed from consolidated snow is random in orientation, and its behavior is somewhat different. The full flow law of ice must be one that covers the complete relation between the stress tensor and the strain-rate tensor. The flow rate falls by a factor of 10 for a 15°C temperature drop from the melting point. -- BLF

SIP 22032

061.3:551.322:551.578.4

Kingery, W. D. (ed.)  
ICE AND SNOW: PROPERTIES, PROCESSES, AND APPLICATIONS. PROCEEDINGS OF A CONFERENCE HELD AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, FEBRUARY 12-16, 1962. Cambridge, Mass., M.I.T. Press, 1963, 684p. incl. illus., tables, graphs, diagrs., 460 refs. DLC, GB2405.K55

Forty-six papers are presented by chemists, ceramists, metallurgists, physicists, geologists, meteorologists, and others with divergent backgrounds and professional associations. Twelve papers discuss ice properties; 3 deal with glacier flow; 8 treat solidification phenomena and sea ice; 4 are on the bearing capacity of ice; 15 are concerned with snow properties; and 4 discuss the ablation of ice and frozen surfaces. For individual papers see SIP 22033-22078. -- BLE

SIP 22034

551.322:539.37

Gold, L. W.  
DEFORMATION MECHANISMS IN ICE. p. 8-27 incl. illus., graph. (In: W. D. Kingery (ed.). Ice and Snow: Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 29 refs. DLC, GB2405.K55

Information was obtained on the deformation mechanisms that occurred during experiments on crack formation in ice subject to a constant compressive load. These mechanisms are described, related to similar observations that have been made on ice and other materials, and their significance is discussed with respect to the deformation behavior of ice. The ice in the experiments was made from deaerated tap water in a galvanized tank. Two balloons were placed under a weighted platform at the bottom of the tank and filled with air which was maintained at constant pressure by connecting the balloons to a tube submerged in a column of ethylene glycol. When cooled sufficiently, the water was seeded with fine-grain snow spread densely enough to cover the surface completely. As the water froze, the change in volume forced air from the balloons into the column of glycol permitting the water to freeze at almost constant pressure. Two sets of experiments were designed to investigate the dependence of the direction of the crack on the crystallographic orientation of the grain in which it formed. Observations were made on rectangular blocks of 2 sizes: 5 x 10 x 25 cm and 2.5 x 5 x 15 cm. The test pieces were prepared from ice from which the upper 2 cm containing the transition associated with the freezing technique had been removed. Among the topics discussed are the formation of slip bands, grain boundary migration, unusual creep behavior, and the response of a grain to an applied load. -- BLE

SIP 22033

551.322:532.135

Glen, J. W.  
THE RHEOLOGY OF ICE. p. 3-7. (In: W. D. Kingery (ed.). Ice and Snow: Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 13 refs. DLC, GB2405.K55

The important factors determining the behavior of ice masses under stress are: (1) the mechanical behavior of single ice crystals, (2) the restraints imposed on the individual crystals in a polycrystalline aggregate, and (3) the way in which ice deforms. Slip on the basal plane is the only mode of plastic deformation of single ice crystals that has been convincingly demonstrated. The deformation of ice crystals show creep even at low stresses, but unlike that of other materials, the creep rate of ice accelerates as time proceeds. Attempts to find a glide direction for ice

# CRREL BIBLIOGRAPHY

SIP 22035

551.322:548.54

Weertman, J.  
**THE ESHELBY-SCHOECK VISCOUS DISLOCATION DAMPING MECHANISM APPLIED TO THE STEADY-STATE CREEP OF ICE.** p. 28-33 incl. table. (In: W. D. Kingery (ed.). *Ice and Snow; Properties, Processes, and Applications.* ... Cambridge, Mass., M.I.T. Press, 1963). 16 refs.  
 DLC, GB2405, K55

The Eshelby-Schoeck damping mechanism can account for the creep of ice. However, it is not possible at present to rule out dislocation climb as a rate-controlling mechanism. Eshelby's analysis makes it possible to obtain an expression for the dislocation velocity that contains only experimentally measurable terms. Likewise, the creep equation in which this velocity is used contains only experimentally measurable terms. It is probable that the wide difference between creep rates of single crystals and of polycrystalline ice can be explained by geometry effect. The activation energy of creep should be the same as that associated with the internal friction peak if the Eshelby-Schoeck mechanism is rate controlling. Most creep evidence today favors a value near 14,000 cal/mole. The creep rate in D<sub>2</sub>O ice is shown to be slower than that of ordinary ice by amounts ranging from  $\sqrt{2}$  to 2. Movement measurements of low angle boundaries in ice by Higashi and Sakai (SIP 19818) have shown that dislocations move by an activated process with an energy in the region of 14,000 cal/mole and that the velocity is proportional to the stress. -- Geophys. Abstracts

SIP 22036

551.322:548.5

Kuroiwa, Daisuke and Wayne L. Hamilton  
**STUDIES OF ICE ETCHING AND DISLOCATION ETCH PITS.** p. 34-55 incl. illus., diagrs. (In: W. D. Kingery (ed.). *Ice and Snow; Properties, Processes, and Applications.* ... Cambridge, Mass., M.I.T. Press, 1963). 10 refs.  
 DLC, GB2405, K55

This study was made (1) to reveal the mechanism by which etch pits are transformed under a plastic film, (2) to find out the most effective and reliable etching technique for detection of ice crystal imperfections, and (3) to confirm experimentally how dislocation theories can be applied to ice crystals. All experiments were carried out in a cold room at the USA Cold Regions Research and Engineering Laboratory at a constant temperature of -10° C. Included in the discussion are (a) the role of the plastic film and solvent in etch pit formation, (b) slip direction revealed by thermal etch pits and channels, (c) etching technique for detection of dislocation defects, (d) characteristics of dislocation etch pits, (e) the depth of hexagonal pyramidal etch pits, (f) the symmetry of distribution of dislocation etch pits on fracture surfaces, (g) dislocation movement caused by applied stresses and particular slip directions on the basal plane of ice, and (h) interactions between the disloca-

tions and inclusions in ice crystals. It was confirmed that evaporation etch pits produced under a plastic film have no correlation with dislocation defects, and that they are formed by evaporation through microair cavities or tiny holes existing in the plastic film itself. A solution of 5 to 6% Formvar in ethylene dichloride is a suitable etchant for detecting dislocation defects that emerged on the (0001) plane. This etchant was not successful for the detection of dislocation that contributes to basal slip. -- BLE

SIP 22037

551.322:548(57)

Eckerbom, Eric and Erkki Palosuo  
**A STUDY OF ICE CRYSTALS AT STORGLACIÄREN.** p. 56-62 incl. illus., tables, map. (In: W. D. Kingery (ed.). *Ice and Snow; Properties, Processes, and Applications.* ... Cambridge, Mass., M.I.T. Press, 1963). 7 refs.  
 DLC, GB2405, K55

This investigation was performed July 16 to 25, 1961, and covered six sampling stations. Since the ice surface was rough and the uppermost layer, especially after a sunny day, consisted of loose crystals, the surface layer was cut away with a chain saw. The chain was run over an idler that permitted the usual oiling of the chain to be avoided and a clean ice surface to be cut. The crystals were revealed by the method used by Ahlmann on Isfallsglaciären, Kebnekajse. Brown umbra, methylene blue, or machite green, which do not dissolve in water, were spread on the smooth surface. For measurements of ice crystal cross sections, best results were obtained by photographing the surface as soon as the dye had been spread and before it had sunk too deep or had begun to flow away. A yellow filter was used and stereophotos were taken. To estimate the third dimension, crystal volumes were measured on a sunny day when many loose crystals could be seen on the glacier. Each ice crystal was weighed and the 3 dimensions were measured: first the largest one and then the average width of the other two as nearly as possible perpendicular to the first one as well as to each other. The form and sizes of air bubbles were determined from the photographs of etched ice surfaces, and some special observations were also made. -- BLE

SIP 22038

551.322:539.371

Anderson, Don L.  
**USE OF LONG-PERIOD SURFACE WAVES FOR DETERMINATION OF ELASTIC AND PETROLOGICAL PROPERTIES OF ICE MASSES.** p. 63-68 incl. graph. (In: W. D. Kingery (ed.). *Ice and Snow; Properties, Processes, and Applications.* ... Cambridge, Mass., M.I.T. Press, 1963). 6 refs.  
 DLC, GB2405, K55

See SIP 20251.

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SIP 22039

551.326.7:539.32(712.2)

Langleben, M. P. and E. R. Pounder  
ELASTIC PARAMETERS OF SEA ICE. p. 69-78 incl.  
tables, graphs. (In: W. D. Kingery (ed.). *Ice and  
Snow; Properties, Processes, and Applications*. ...  
Cambridge, Mass., M.I.T. Press, 1963). 4 refs.  
DLC, GB2405, K35

The data were collected on 4 field trips between 1959  
and 1962 to Barrow Strait, Thule, Isachsen (Ellef  
Ringnes Island), and McClure Strait. The measure-  
ments were all made on sections of ice cores ex-  
tracted from the ice cover with a 3-in. SIPRE coring  
auger. The bulk velocity in a 6-in. core section was  
found by attaching barium titanate transducers to  
both ends, exciting the input transducer with repeti-  
tive pulses having a sharp leading edge, and meas-  
uring the transit time in the ice of a pulse of longi-  
tudinal sound waves. The density profile of the ice  
cover was measured by weighing core samples and  
then finding their volumes by a displacement method.  
On completion of the acoustic measurements, the  
salinity of each sample was measured. The theory  
involved is described with a system of equations. It  
is shown that the density in a particular ice cover  
varies only slightly with depth, despite variations in  
salinity and ice temperature. Values obtained for  
Poisson's ratio are tabulated. Results indicate a good  
fit for a linear relationship between Young's modulus  
E and the brine content for cold ice. A similar  
linear relation with different coefficients was found  
for "warm" polar ice. -- BLE

SIP 22040

551.326.7:539.32+.42(+49+\*38)

Brown, James H.  
ELASTICITY AND STRENGTH OF SEA ICE. p. 79-  
106 incl. tables, graphs, diagrs. (In: W. D.  
Kingery (ed.). *Ice and Snow; Properties, Processes,  
and Applications*. ... Cambridge, Mass., M.I.T.  
Press, 1963). 15 refs.  
DLC, GB2405, K35

Measurements were made of annual sea ice at Wales,  
Alaska, in 1958 and 1959, and at Thule, Greenland,  
in 1961. The elastic moduli of the ice sheets were  
obtained by propagating elastic waves in the ice.  
These waves were generated from small explosive  
charges and from hammer blows. Flexural strength  
measurements were made by cutting a cantilever  
beam in the ice and measuring the applied force at  
failure as the free end of the beam was pulled up.  
Brine content and density were also measured. The  
values of Young's modulus, shear modulus, and  
Poisson's ratio are tabulated, and plate wave velocity  
versus brine content is graphed. It is shown that  
brine content is a variable which best explains varia-  
tions in plate wave velocity, and that there is an  
apparent relationship between flexural strength and  
brine content. The relation for Young's modulus and  
Poisson's ratio, which Bailey and Hicks obtained  
from the theory of stresses, is given. The concept  
of the redistribution of stresses using the theory of

perforated plates is shown to give good results for an  
elasticity-strength model. -- BLE

SIP 22041

551.326.7:539.3

Peyton, H. R.  
SOME MECHANICAL PROPERTIES OF SEA ICE.  
p. 107-119 incl. graphs. (In: W. D. Kingery (ed.).  
*Ice and Snow; Properties, Processes, and Applica-  
tions*. ... Cambridge, Mass., M.I.T. Press,  
1963).  
DLC, GB2405, K35

Laboratory studies were made for cataloging the  
strength of sea ice against the significant parameters  
of strength with associated stress-strain relation-  
ships, rate of loading, ice forms including chlorinity  
and crystal size and shape, and temperature. Pre-  
liminary results indicate that sea ice can be tested by  
stress-strain techniques in tension, compression,  
tensile creep, and compressive creep. It appears  
feasible to predict the strength of sea ice types by  
determining the magnitude of the significant para-  
meters -- ice form, chlorinity, temperature, and  
rate of loading. With ice forms that may have uni-  
directional c-axis orientation over large volumes of  
ice, the crystal orientation has a large effect on  
strength, and the magnitude of this effect can be pre-  
determined for laboratory specimens. Creep rates  
and associated viscoelastic behavior and failures can  
be determined in both tension and compression. The  
testing techniques are sufficiently simple to provide  
a standard laboratory technique for the study of the  
mechanical properties of sea ice. -- Geophysics  
Abstracts

SIP 22042

551.326.7:620.172(712.2)

Graystone, Peter and M. P. Langleben  
RING TENSILE STRENGTH OF SEA ICE. p. 114-  
123 incl. tables, graphs. (In: W. D. Kingery (ed.).  
*Ice and Snow; Properties, Processes, and Applica-  
tions*. ... Cambridge, Mass., M.I.T. Press,  
1963). 9 refs.  
DLC, GB2405, K35

Tests were made of the ultimate tensile strength of  
sea ice in Resolute and Button Bays. The working  
procedure consisted of extracting a 3-in. -diam.  
vertical core from the ice sheet, sawing the cylindri-  
cal core into samples 3 in. long, drilling a 1/2-in.  
hole along the axis of the samples, breaking the  
samples in a screw-jack type press, and setting the  
broken samples aside in sealed containers for sub-  
sequent determination of salinity. The proving ring  
used with the press was calibrated at each test tem-  
perature during stored ice tests. The calibration  
showed virtually no temperature dependence. The  
tests of ultimate tensile strength were performed  
under 2 types of conditions. (1) For the so-called in  
situ tests, a 3-ft-long core was completely processed

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in less than 20 min after its extraction. Testing proceeded from the lowest sample upward. (2) For samples having different thermal histories, each cylindrical sample was prepared for the press and stored in a rack in such a manner that the axis of the sample was vertically oriented for from 1 day to several weeks. They were then tested for ultimate tensile strength at the ambient temperature. The data suggest the existence of a linear relationship between the ultimate tensile strength of sea ice and the square root of its brine content. The data for ice at temperatures below  $-8.2^{\circ}\text{C}$  cover a limited range of brine content, and the line of best fit is speculative. -- BLE

SIP 22043

551.326.7:539.42

Kingery, W. D. and D. N. French  
STRESS-RUPTURE BEHAVIOR OF SEA ICE. p. 124-129 incl. tables, graph. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 10 refs.  
DLC, GB2405, K35

This investigation was made as part of Project ICE WAY. All experiments were performed on simply supported beams with a 1 x 1 in. cross section and 6-in. length between 1/2-in.-diam. aluminum rod supports. The load was applied to a 1/2-in.-diam. rod at the center of the span by means of a yoke connected to weights hanging below the sample and frame. On fracture, the weight fell on a micro-switch, stopping an electric timing clock. Samples of natural sea ice were taken from a layer 1 to 3 in. from the surface in a single 10-ft by 10-ft area 1-1/2 mi. from shore. The samples were tested with the top of the specimen (compression side) corresponding to the top of the ice sheet. The sample characteristics were the following: density = 0.809 gm/cm<sup>3</sup>, salinity = 0.80%, and grain size = 0.14 x 0.4 in. It is concluded that sea ice exhibits typical stress-rupture failure in which the average rupture stress decreases from 258 psi for 0.1-sec loading to 175 psi at 10<sup>-4</sup>-hr loading. As a result, it is essential to define the time of loading as one of the parameters fixing the load-bearing capacity of sea ice. -- BLE

SIP 22044

624.147:539.42

Coble, R. L. and W. D. Kingery  
ICE REINFORCEMENT. p. 130-148 incl. illus., tables, graphs, diagrs. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 9 refs.  
DLC, GB2405, K35

The purpose of this study was to determine the re-

quirements fixing the selection of a reinforcing material from the point of view of technical, economic, and logistic feasibilities for use in the Arctic. Materials tested included Fiberglass yarn, Fiberglass insulating mat, long and short wood and asbestos fiber, newspaper mash, bond paper mash and strips, starch, and starch with long asbestos fiber. All samples were prepared with tap water. The strength of composites was determined by measuring the modulus of rupture. In some cases the load was applied manually with a water-filled container suspended from the loading saddle. It is concluded that (1) ice composite strength increases linearly with increasing volume fraction of fiber additions for several materials tested, (2) with short fiber, fracture results from shear failure in the matrix, (3) highest strengths can be achieved with Fiberglass, (4) starch gels reinforce fresh water ice but not salt ice, and (5) least expensive reinforcement is achieved with newspaper mash. -- BLE

SIP 22045

551.324.63

Nye, J. F.  
THEORY OF GLACIER VARIATIONS. p. 151-161 incl. diagrs. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 12 refs.  
DLC, GB2405, K35

See SIP 20264.

SIP 22046

551.324.51

551.324.24:624.19(494)

Haefeli, R.  
OBSERVATIONS IN ICE TUNNELS AND THE FLOW LAW OF ICE. p. 162-186 incl. illus., table, graphs, diagrs. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 11 refs.  
DLC, GB2405, K35

Measurements made during the first 10 yr of the 136-m ice tunnel in the cold ice cap on the Jungfraujoch are coordinated, and some of the earlier measurements made in temperate ice tunnels have been consulted for comparison. This comparison permits the differences in the behavior of cold and temperate ice to be manifested. The following topics are discussed: (1) climate and ice temperature, (2) accumulation and ablation on the ice cap, (3) stress conditions, (4) ice movement and deformation, (5) a flow test with ice samples, (6) the deformation of circular tunnels, "Blockschollen" and slices (plates), and (7) observations and surveys in ice caverns and crevasses. On the ice cap of the Jungfraujoch, exceptionally large differences between neighboring points of the cross profile in regard to the amount of accumulation were measured. If the tensile strength in the tension zone of the ice cap is exceeded at any

# CRREL BIBLIOGRAPHY

point, progressive rupture causes a sudden ripping up of a very narrow crack that widens slowly into a wide, longitudinal crevasse. -- BLE

SIP 22047

551,321,5:539,37  
551,324,24:624,19(988)

Roethlisberger, Hans  
ULTRASONIC MEASUREMENTS OF DEFORMATION  
AROUND A RECTANGULAR ICE TUNNEL. p. 187-  
211 incl. tables, graphs, diagrs. (In: W. D.  
Kingery (ed.). Ice and Snow; Properties, Processes,  
and Applications. ... Cambridge, Mass., M.I.T.  
Press, 1963). 8 refs.  
DLC, GB2405, K55

Measurements were made around the Tuto tunnel, a system of caverns made near the edge of the Greenland ice cap in glacier ice of about -11°C. For ultrasonic measurements, an originally vertical cross section perpendicular to the long axis of the research room was instrumented. The transducers (ceramic cells) were installed in a plane through the center of the room, 30 m from each end, and also in other places. A short pulse of a mechanical vibration is produced electrically in a piezoelectric transducer. This pulse travels as an elastic wave to a second transducer at a distance, and is there transformed back into an electrical signal. The electronic equipment used for producing the ultrasonic pulses and measuring the transit time consisted of a single commercial unit, "Soniscope," designed for concrete testing. The data processing is described. The flow pattern around the room studied was found to have 2 motions - a shear motion caused by the flow of the glacier, and a radial motion toward the room caused by the closure of the opening under the pressure of the overburden. It is pointed out that: (1) the picture of the general flow pattern will be improved as deformation increases and successive measurements are made, (2) a more accurate time-measuring device is needed to observe changes in flow from year to year, and (3) changes in velocity of the ice with time should be investigated together with the ice fabric of the area. -- BLE

SIP 22048

551,322:536,4,031+536,421,4

Harrison, J. D. and W. A. Tiller  
CONTROLLED FREEZING OF WATER. p. 215-225  
incl. illus., graphs, diagrs. (In: W. D. Kingery  
(ed.). Ice and Snow; Properties, Processes, and  
Applications. ... Cambridge, Mass., M.I.T.  
Press, 1963). 19 refs.  
DLC, GB2405, K55

This paper describes the experimental procedure, and presents some qualitative results concerning several morphological details of the interface. Quantitative calculations on the amount of chemical segregation occurring during the cellular or dendritic

mode of solidification are also given. A device was constructed in which a long, thin sample of water could be frozen progressively from one end while permitting continuous microscopic observation of the water-ice interface. The water chamber was filled with distilled water and the heat sink with dry ice and alcohol. The flow of heat from the water sample into the heat sink was throttled by small resistance heaters that were adjusted initially to prevent freezing. The morphologies observed during the solidification of sea water and other aqueous systems have been found to be consistent with those observed in metallic systems and expected from a consideration of the general understanding of growth from the melt. Further, it was predicted that an appreciable volume fraction of the second phase forms a network during the normal solidification of sea ice. Since in certain temperature ranges this network becomes liquid, deteriorating the material strength, a challenge for controlled solidification would be the dispersal of this second phase as unconnected regions in the relatively pure ice matrix. -- BLE

SIP 22049

551,322:548,5

Pounder, E. R.  
CRYSTAL GROWTH RATES AS A FUNCTION OF  
ORIENTATION. p. 226-231 incl. diagrs., graphs.  
(In: W. D. Kingery (ed.). Ice and Snow; Properties,  
Processes, and Applications. ... Cambridge,  
Mass., M.I.T. Press, 1963). 5 refs.  
DLC, GB2405, K55

An experiment was undertaken to measure the growth rates of ice crystals under more closely controlled conditions. A mosaic was constructed consisting of 2 single crystals of different orientations, the smaller crystal being enclosed by the larger. This mosaic is then used as a seed for further ice growth so that the growth rate of the small central crystal can be studied as a function of relative orientation. Single crystals were grown by the modified Bridgman method. These were used as seed crystals to grow larger single crystals from the melt. After considerable trial and error, single crystals 10 cm in diam. by 10 cm long were produced fairly readily. After the ice mosaic had frozen to a suitable thickness, it was removed, and thin horizontal sections were cut at various depths to study crystal sizes and orientations with a universal stage polariscope. Orientations of c-axes were measured by the Rigby method. The pattern of an annual-sea-ice-cover surface layer consists of small, randomly oriented crystals with a strong preference for vertical optic axes, but the bulk of the cover consists of larger crystals with horizontal c-axes. A cover frozen from fresh water consists either of crystals with mostly vertical c-axes or crystals with mostly horizontal c-axes. -- BLE

# CRREL BIBLIOGRAPHY

SIP 22050

551.326.7:548.2

Palosuo, Erkki and Martti Sippola  
CRYSTAL ORIENTATION IN SALT-WATER ICE.  
p. 232-236 incl. illus., graph. (In: W. D. Kingery  
(ed.). Ice and Snow; Properties, Processes, and  
Applications. ... Cambridge, Mass., M.I.T.  
Press, 1963). 5 refs.  
DLC, GB2405.K55

See SIP 20265.

SIP 22051

551.326.7:539.217:664.41

Kingery, W. D. and W. H. Goodnow  
BRINE MIGRATION IN SALT ICE. p. 237-247 incl.  
diags., graphs. (In: W. D. Kingery (ed.). Ice and  
Snow; Properties, Processes, and Applications. ...  
Cambridge, Mass., M.I.T. Press, 1963). 11 refs.  
DLC, GB2405.K55

In order to simulate the columnar structure of Arctic  
sea ice, a freezing tank was constructed for plane-  
front freezing from the top surface. A 22-gal can  
was encased in 5 in. of shredded cork insulation,  
filled 3/4 full with a 3.5% NaCl solution, and placed  
in a -40°C cold chamber with the top open. After 7  
days the tank was taken from the chamber and the  
ice slab was removed. The section from which sam-  
ples for block migration were selected was a cylindri-  
cal disc from 1 to 5 in. below the top surface of the  
7-in.-thick block of ice. A furnace was constructed  
for the microscopic observation of brine-pocket  
migration. To observe migration in fine-grained  
samples, test tubes of 3.5% NaCl were frozen rapidly  
at -40°C. Data indicate that (1) gravity drainage of  
brine is the primary mechanism by which salt is  
eliminated from new sea ice, (2) movement of en-  
trapped pockets under a temperature gradient con-  
tributes to the net reduction in salt content to a small  
extent, and (3) the velocity of migration of brine  
pockets is limited by the rate of solute diffusion. --  
BLE

SIP 22052

551.326.7:543.3(+3)

Bennington, Kenneth O.  
SOME CHEMICAL COMPOSITION STUDIES ON ARC-  
TIC SEA ICE. p. 248-257 incl. illus., tables,  
graphs. (In: W. D. Kingery (ed.). Ice and Snow;  
Properties, Processes, and Applications. ...  
Cambridge, Mass., M.I.T. Press, 1963). 7 refs.  
DLC, GB2405.K55

Analyses were made of liquid and residue samples of  
Arctic sea ice, at the Pennsylvania State University.  
The procedure was identical for both samples except  
that the residues were converted to the sulphate be-  
cause they contained deliquescent material which  
would make accurate weights difficult to obtain.

Samples were collected from both pack ice and young  
sea ice. The young pack ice, which was about 1.5 m  
thick, was sampled with a SIPRE corer. The banded  
samples were cut into slabs, and the individual bands  
were separated by hand sawing. All specimens, in-  
cluding the core samples, were melted in closed con-  
tainers and filtered. The analytical procedure is de-  
scribed. The curves for all analyses are remarkably  
parallel, and any deviation from parallelism is  
sporadic. The surface of young sea ice is commonly  
covered with efflorescence crystals as well as brine  
expelled toward the surface during ambient tempera-  
ture fluctuations that temporarily reverse the surface  
thermal gradient. The surface crystals are swept  
along with the snow, and tend to seed aged pack ice at  
the beginning of a new melt season. Data indicate  
that the ratios between the more abundant substances  
vary little from those of sea water. The salts con-  
tinue in constant ratio so that only the total amount of  
salt varies. The salt proportions remain unaffected  
by such major change in the system as the removal of  
water by freezing. -- BLE

SIP 22053

551.326.7:539.4

Weeks, W. F. and A. Assur  
STRUCTURAL CONTROL OF THE VERTICAL VARI-  
ATION OF THE STRENGTH OF SEA AND SALT ICE.  
p. 258-276 incl. tables, graphs, diags. (In: W. D.  
Kingery (ed.). Ice and Snow; Properties, Processes,  
and Applications. ... Cambridge, Mass., M.I.T.  
Press, 1963). 16 refs.  
DLC, GB2405.K55

This study demonstrates that in NaCl ice sheets the  
systematic increase in the plate width with depth  
produces significant changes in the ring-tensile  
strength of the ice. Field tests indicate that similar  
relations exist for sea ice. An ideal place to study  
the natural occurrence of this variation is thick one-  
year-old sheets of unrafted pack ice. This ice pro-  
vides a maximum variation in plate width. The tests  
should be performed in the early summer when the  
ice is essentially isothermal, 0 to -1.6°C, and  
isosaline, 0 to 3.2‰. The near melting tempera-  
tures will produce large brine volumes that should  
result in an appreciable strength variation as a func-  
tion of location in the ice sheet. In cold young sea  
ice the brine volume is commonly lower, while the  
temperature and salinity gradients in the ice are quite  
pronounced. It therefore would be difficult to sepa-  
rate the effect of the change in substructure from  
other effects. Although changes in plate width are  
most clearly revealed in strength changes, they  
should also affect the thermal conductivity. (Authors'  
abstract)

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SIP 22054

551,326,7:536,421,4:663,631

Adams, C. M., D. N. French and W. D. Kingery  
FIELD SOLIDIFICATION AND DESALINATION OF  
SEA ICE. p. 277-288 incl. tables, graphs. In:  
W. D. Kingery (ed.). Ice and Snow; Properties,  
Processes, and Applications. ... Cambridge,  
Mass., M.I.T. Press, 1963). 11 refs.  
DLC, GB2405, K35

Field and laboratory studies of the solidification process under different conditions and of resulting ice structure and salinity were carried out at Point Barrow, Alaska (during Feb. and March, 1960), and at the Eglin Air Force Base (during July and Aug., 1960). Investigated were the solidification rate and degree of desalination that could be obtained under field conditions utilizing the ambient low temperatures available in the Arctic. The variables that affect the rate of ice formation and its salinity when formed from ponds, by rapid or slow solidification from rapidly moving streams, and from sprays have been determined. It is concluded that (1) no practical solidification process is effective in forming ice having a salt content as low as the natural ice found in the Arctic Ocean in March, which has a salinity of 0.4 to 0.9%, (2) spray solidification is an effective method of very rapidly forming sea ice, (effective heat transfer coefficients and spray characteristics necessary for efficient use of this method have been determined), and (3) salt migration phenomena are of greater importance in flooded ice and other ice structures than has been commonly recognized. -- BLE

SIP 22055

624,147:551,326,7

Dykina, J. E.  
CONSTRUCTION OF SEA ICE PLATFORMS. p. 289-301 incl. illus., graph, diagr. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 7 refs.  
DLC, GB2405, K35

Methods of constructing artificial ice islands are discussed and the results of the experimental investigations conducted thus far by the Navy are given. Construction techniques have been classified as liquid- or dry-fill methods, with or without strength additives. Liquid fill is the applied layers of ice formed by transferring sea water to the surface of the existing ice and allowing it to freeze before applying the next layer. Also grouped here are the spray and sprinkler methods. Dry fill is the applied layers of icecrete formed by adding lifts of ice aggregate to the surface of the existing ice. Bonding of the aggregate for greater strength is achieved by saturating the fill with sea water. The only strength additive used to date has been Fiberglas. The free flooding method is described. The prediction of platform strength, and natural forces affecting ice platforms are also discussed. (See also SIP 20604)  
-- BLE

SIP 22056

551,322:539,37

Cutcliffe, J. L., W. D. Kingery and R. L. Coble  
ELASTIC AND TIME-DEPENDENT DEFORMATION OF ICE SHEETS. p. 305-310 incl. graphs. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963).  
DLC, GB2405, K35

The creep behavior of a rectangular cross section of ice subjected to a constant moment and shear with a uniform temperature variation across the cross section was studied. A general integral equation is given which was set up for the stress-strain-time relationship; this is solved by numerical integration on a high-speed digital computer. It is shown that if a section of ice is loaded with a constant moment and shear, the maximum longitudinal stress on the high-temperature side decreases with time, while the maximum longitudinal stress on the low-temperature side increases with time. The maximum unit shear stress increases with time. The effective rigidity modulus decreases with time. If the true bending moment and shear are constant in the cross section, the effect of creep deformation is to increase the stress at the low-temperature face of the ice sheet (top surface), decrease the stress at the high-temperature face of the ice sheet (bottom surface), and increase the value of the maximum unit shear stress. As a result of creep, the maximum bending moment in an ice sheet loaded with a concentrated load will decrease, but the maximum value of unit shear stress will increase. -- BLE

SIP 22057

551,322:539,37

Hobbs, H. A., J. L. Cutcliffe and W. D. Kingery  
EFFECT OF CREEP AND TEMPERATURE GRADIENTS ON LONG-TIME DEFORMATION OF ICE SHEETS. p. 311-321 incl. graphs, diagr. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 4 refs.  
DLC, GB2405, K35

The differential equation for an anisotropic flat plate symmetrical about an axis perpendicular to the plate has been derived. The equation applies to a floating ice sheet with a rigidity modulus. The rigidity modulus is a function of the radius and is assumed to change as a result of creep. Finite difference relationships were used to transform the differential equation into a difference equation, and a computer program was written to give a numerical solution to the problem for any parameters. Sixty points equally spaced along a radius of 300 ft were considered. It is concluded that with time, an ice sheet loaded with a concentrated load will deform into a shape corresponding to a lower modulus of elasticity. This will result in deflections under the load, which continually increase with time but at a reduced rate. Some interesting relationships have been established, but the problem is not completely solved. Recommendations are given for further work. -- BLE

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SIP 22058

551.326.7:629.139.85:620.19

Kingery, W. D. and R. L. Coble  
CRACKS IN SEA ICE AND THEIR EFFECT ON  
OPERATIONS. p. 322-334 incl. illus. (In: W. D.  
Kingery (ed.). Ice and Snow; Properties, Processes,  
and Applications. ... Cambridge, Mass., M.I.T.  
Press, 1963). 10 refs.  
DLC, GB2405.K55

Types of cracks and their sources are discussed, and a rational basis for estimating the effects of cracks is given. Open wet cracks which pass completely through the ice sheet have the most deleterious effect on load-bearing capacity. These cracks can result from wind or tidal wave action. Superficial (top and bottom) surface cracks can result from thermal stress, applied loads, and load removal. Crack observations at North Star Bay runway and load-bearing capacity based on buoyancy are also discussed. Unless open wet cracks are present in the immediate area of loading, ice is remarkably insensitive to the presence of cracks because: (1) areas can be found in which few or none are present; (2) top surface cracks have little effect on initial cracking; (3) large cracks that have had an opportunity to undergo rounding at the tip do not cause strength reduction; (4) load-bearing capacity based on buoyancy shows that cracks in the region beyond the radius of relative stiffness are not as serious as supposed when it is assumed that the ice sheet derives little load-bearing capacity from buoyancy; and (5) a change in sign of the bending moment after initial bottom surface cracking occurs within the radius of relative stiffness. -- BLE

SIP 22059

551.326.2

Assur, Andrew  
BREAKUP OF PACK-ICE FLOES. p. 335-347. (In:  
W. D. Kingery (ed.). Ice and Snow; Properties,  
Processes, and Applications. ... Cambridge,  
Mass., M.I.T. Press, 1963).  
DLC, GB2405.K55

Long-wave cracks are mathematically analyzed on the basis of plate mechanics, and other forms of cracks are discussed. Long-wave cracks form with complete disregard of thickness and shape of the floes. They form instantaneously; the crack propagation is fast; there is no way to predict the location of a crack to be formed; and the ice floe, once split, drifts apart in a matter of minutes. Parallel-edge cracks running closely alongside existing edges are by far the most common. They form 12 to 15 m from the edge under combined bending and buckling originating from the pressure exerted from a neighboring floe. Perpendicular-edge cracks which form at fairly uniform distances of 50 to 100 m apart, are more dangerous for the existence of an intact ice floe. They may propagate beyond the parallel crack into the ice floe and give reason for concern and action on behalf of the occupants of an ice floe. The potential danger of perpendicular cracks lies in the

forces created under the shearing action of adjacent ice floes. The moment originated by these forces may be enough to propagate a perpendicular crack (scissor crack) across an ice floe and separate a portion of it. Subsequent shear motion between the pieces of the ice floe may produce shearing cracks on the base of projecting corners. -- BLE

SIP 22060

551.578.463

Bader, Henri  
THEORY OF DENSIFICATION OF DRY SNOW ON  
HIGH POLAR GLACIERS, II. p. 351-376 incl.  
tables, graphs. (In: W. D. Kingery (ed.). Ice and  
Snow; Properties, Processes, and Applications. ...  
Cambridge, Mass., M.I.T. Press, 1963). 5 refs.  
DLC, GB2405.K55

See SIP 20845.

SIP 22061

551.578.463

de Quervain, M. R.  
ON THE METAMORPHISM OF SNOW. p. 377-390  
incl. tables, diagrs., graphs. (In: W. D. Kingery  
(ed.). Ice and Snow; Properties, Processes, and  
Applications. ... Cambridge, Mass., M.I.T.  
Press, 1963). 11 refs.  
DLC, GB2405.K55

Metamorphism is characterized by 3 processes appearing either isolated or combined. They are: (1) a rearrangement of ice substance in the immediate surroundings of a crystal, originating in a thermodynamic instability of the crystal surface; (2) an extensive transfer of substance as vapor, initiated by local differences of temperature and vapor concentration; and (3) melting and refreezing. The first processes are called "destructive" and "constructive metamorphism" and the third is designated "melt metamorphism." Destructive metamorphism begins with a disintegration. The articulated snow stars decompose into single fragments. After that the smallest particles dissipate in favor of bigger ones until an aggregate of rounded, isometric, oblong, or irregular grains of uniform size is formed. Constructive metamorphism is characterized by an intense growth of grains situated in a privileged position and by the dissipation of other less favored ones. The medium of melt metamorphism is the isothermal system of ice, water, and vapor. The significance of metamorphism is discussed, speculations on the mechanism are given, and snow-property data obtained from special experiments are tabulated. -- BLE



# CRREL BIBLIOGRAPHY

SIP 22062

551, 578, 463(\*2)

Anderson, Don L. and Carl S. Benson  
THE DENSIFICATION AND DIAGENESIS OF SNOW,  
p. 391-411 incl. table, graphs. (In: W. D. Kingery  
(ed.), Ice and Snow; Properties, Processes, and  
Applications. ... Cambridge, Mass., M.I.T.  
Press, 1963). 15 refs.  
DLC, GB2405, K55

This paper discusses the diagenetic processes occurring within the sedimentary veneer of the Greenland and Antarctic Ice Sheets, causing evolution of loose snow into glacier ice. The discussion is based partly on field observations from Greenland, but it deals also with the general problem of snow densification. A simple analytical expression for depth-density profiles is determined which incorporates parameters that are descriptive of the in-situ conditions of the snow. Mechanisms of densification are described, densification of snow with less and greater than critical density are discussed, compactibility is defined, and the significance of the critical density in making a physical distinction between snow, firn, névé, and glacier ice is shown. -- BLE

SIP 22063

551, 578, 463(\*2)

Costes, Nicholas C.  
ON THE PROCESS OF NORMAL SNOW DENSIFICATION IN AN ICE CAP. p. 412-431 incl. illus.,  
table, graphs. (In: W. D. Kingery (ed.), Ice and  
Snow; Properties, Processes, and Applications. ...  
Cambridge, Mass., M.I.T. Press, 1963). 6 refs.  
DLC, GB2405, K55

Parameters describing the normal snow densification process have been obtained for 3 ice-cap stations in Greenland and 5 ice-cap stations in Antarctica. These parameters were extracted from depth-density profiles in which the age of the stratigraphic layers had been determined. The normal snow densification process in an ice cap can be described by a layered system of rheological models, each consisting of a modified Kelvin unit, acting in compression only. The analytical expressions which are presented are based on the assumption that the rate of snow accumulation is constant with time and that no velocity gradients are present other than that associated with the vertical densification of the ice cap. Further refinement of this theory can be obtained by considering the effect of a varying rate of snow accumulation on the densification process, and also by considering the kinematic problem in which the flow of the glacier is taken into account. (From author's summary)

SIP 22064

551, 522; 621, 926-531, 75

Kingery, W. D., H. J. Oberson, Jr. and P. L.  
De Bruyn  
ICE COMMINUTION. p. 432-437 incl. graphs. (In:  
W. D. Kingery (ed.), Ice and Snow; Properties,  
Processes, and Applications. ... Cambridge,  
Mass., M.I.T. Press, 1963). 7 refs.  
DLC, GB2405, K55

An improved high-velocity impact ice grinder was designed, the effect of temperature and rotor speed on the particle size of the final product was investigated, and a suitable method for analyzing the results was developed. Two model grinders were tested. Uniform 1- to 1/4-in. feed was prepared for both with an ice crusher and hand screen. Each grinder was batch fed, and the ice and grinder were stabilized at the temperature being investigated. Initial measurements of particle size were made with an optical microscope and glass line coated with a 1% solution of Formvar in ethylene dichloride. Surface area measurements were made with a standard BET apparatus which determines the volume of gas forming a monomolecular adsorbed layer on the surface of the material being tested. It is concluded that increased rotor speed (greater impact velocity) gives higher surface areas in the resulting product, and that lower grinding temperatures result in higher surface areas at fixed rotor speeds. -- BLE

SIP 22065

624, 147

Wuori, Albert F.  
SNOW STABILIZATION STUDIES. p. 438-458 incl.  
illus., graphs, diags. (In: W. D. Kingery (ed.),  
Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press,  
1963). 8 refs.  
DLC, GB2405, K55

This paper describes some of the snow stabilization studies performed by USA Cold Regions Research and Engineering Laboratory (CRREL) during the past 5 yr. Snow naturally deposited on the surface in layers has a loose structure and a very low initial density of less than 0.1 g/cm<sup>3</sup>. Any disturbance or mechanical agitation of the snow will aid the natural process of metamorphism. When agitation or disaggregation of the snow is combined with mixing of various layers, the result is more desirable. The resulting strength of snow after an age-hardening period is then a function of the particle size distribution and the intimacy of particle contact or density of the snow after processing. Several methods of stabilizing snow have been developed which are effective in producing a surface layer capable of supporting certain types of wheeled vehicles and aircraft. Included in the studies were rotary snow plows, a Swiss Peter snow miller, snow planers, rubber-tired rollers, and large vibratory compactors. The use of additives is also discussed. The results of the testing have shown that the ram hardness test is a fairly reliable indicator of snow

# CRREL BIBLIOGRAPHY

strength up to a ram hardness of 800. Hardness profiles obtained by various stabilizing methods are given. -- BLE

compression of a thin section of snow; and (8) a thermodynamical consideration of the migration of the boundary between two ice crystals under elastic stress. -- BLE

SIP 22066

624, 147

Moser, E. H., Jr.  
NAVY COLD-PROCESSING SNOW-COMPACTION TECHNIQUES. p. 459-484 incl. illus., graphs. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 20 refs.  
DLC, GB2405, K55

The basic Navy cold-processing compaction technique is founded on in-situ acceleration of the natural processes occurring in snow. It consists of depth processing followed by compressive compaction. Variations of the basic technique are double depth processing and layer compaction. Other techniques developed to improve the strength and utilization of compacted snow and to adapt it to special conditions include precompaction preparation of snow areas, surface hardening of compacted snow, maintenance of snow roads and runways, and surface protection under high ambient temperatures and solar radiation. Special equipment to accomplish these techniques is described. Variables that influence the hardness and strength of compacted snow include (1) the geographical location of the compaction area, (2) the season of the year, (3) the type and condition of the snow, (4) the air and snow temperatures, and (5) the length of the age-hardening period. -- BLE

SIP 22068

624, 147(\*2):539, 3, 54, 03

Mellor, Malcolm  
POLAR SNOW - A SUMMARY OF ENGINEERING PROPERTIES. p. 528-559 incl. tables, graphs, diagr. (In: Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 33 refs.  
DLC, GB2405, K55

This review serves as an introduction to snow for the nonspecialist engineer and as a reminder of the many routine, but vital, experiments that are still required to define adequately the properties of snow. Included in the discussion are (1) the general characteristics of ice-cap snow (deposition, sublimatory metamorphism, densification, air permeability, and stratigraphy); (2) temperature changes within surface snow; (3) snow's response to loading; (4) elastic properties and ultimate strength; (5) elastic wave propagation (for sonic frequencies); (6) Poisson's ratio; (7) ultimate strength under rapid loading; (8) unconfined compressive strength; (9) tensile and shear strength; (10) snow hardness; and (11) viscoplastic, thermal, electrical, and frictional properties of snow. -- BLE

SIP 22067

551, 578, 46:539, 3

Yosida, Zyungo  
PHYSICAL PROPERTIES OF SNOW. p. 485-527 incl. illus., tables, graphs, diagr. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 15 refs.  
DLC, GB2405, K55

Studies have been made of the physical properties of snow in Hokkaido, Japan, which has been subjected to sublimation metamorphosis. The different aspects discussed in this report are: (1) metamorphism and compaction of snow within the natural snow cover with emphasis on (a) the effects of sublimation, (b) the vapor pressure of ice under elastic stress, (c) temperature gradient and the metamorphosis of the ice network of snow, and (d) compressive viscosity and density; (2) experiments on the artificial compression of snow and the 3 types of snow contraction (2 types of destructive contraction, and contraction caused by a falling body); (3) temperature and the 3 types of contraction; (4) the magnitude of the force with which a snow pillar resists compression; (5) friction between snow and iron; (6) the transformation of snow into ice by plastic contraction; (7) the plastic

SIP 22069

551, 578, 48  
551, 578, 46:539, 42

Haefeli, R.  
STRESS TRANSFORMATIONS, TENSILE STRENGTHS, AND RUPTURE PROCESSES OF THE SNOW COVER. p. 560-575 incl. illus., table, graphs, diagr. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 6 refs.  
DLC, GB2405, K55

See SIP 20262.

SIP 22070

551, 578, 46:539, 217(\*2)

Waterhouse, R. W.  
ON THE PERMEABILITY OF SNOW IN THE ACCUMULATION ZONE OF POLAR REGIONS. p. 576-585 incl. graphs. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963).  
DLC, GB2405, K55

The permeability of a perpetual snow pack is an important identifying property. The size, shape, and distribution of the interconnected voids in snow that

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define permeability are influenced by many of the same environmental factors that influence density. Permeability is high for low-density and low for high-density material. Air permeability coefficients decrease with depth in accord with increasing density with depth. Thermal metamorphism, another influence on permeability of equal importance, accounts for an increase in permeability. This dual characteristic of permeability in old snow has been the major stumbling block in the way of proper interpretation of the net permeability of snow profiles. Data presented in this paper are from the unpublished records of James Bender, of CRREL. Depth density, depth permeability, and permeability versus density profiles are presented and analyzed from 7000 ft in Greenland at the approximate latitude of Thule. A tentative equation for the densification effect curve is derived which is of the same form as the equation for the thermal metamorphism effects. Together they define the mean permeability for a specific profile. -- BLE

SIP 22071

551.574.42:548.54:547

LaChapelle, E.  
THE CHEMICAL MODIFICATION OF DEPTH HOAR.  
p. 586-593 incl. illus. (In: W. D. Kingery (ed.).  
Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press,  
1963). 9 refs.  
DLC, GB2405, K35

Results are presented of a series of laboratory tests on the practical possibilities of artificial depth hoar modification by trace quantities of chemical poisons. Freshly fallen snow consisting of stellar crystals and a few capped columns was collected in a plastic foam container with six compartments, each of 630-cc capacity. Two or 3 drops of a selected organic liquid were added to each of 5 compartments during collection of the snow sample, the sixth sample was reserved as a control. Thin, loosely fitting black discs were placed on the snow surface in each compartment. Each compartment was sealed with a polyethylene sheet and petroleum jelly. The control sample was provided with a thermocouple at sample bottom and at the black disc. A strong temperature gradient developed in the snow samples which were left exposed to this condition for 16 days. Chemicals used were organic liquids selected on the basis of freezing points and volatility. The size and quantity of depth hoar crystals generated by the experiment were both smaller than might be expected in nature in a similar environment. Results yielded by the individual chemicals are given and it is pointed out that these initial tests are sufficient only to point the way to further experiments. -- BLE

SIP 22072

551.578.46:531.754:620.173

Costes, Nicholas C.  
CONFINED COMPRESSION TESTS IN DRY SNOW. p.  
594-612 incl. graphs, diagrs. (In: W. D. Kingery  
(ed.). Ice and Snow; Properties, Processes, and  
Applications. ... Cambridge, Mass., M.I.T.  
Press, 1963). 9 refs.  
DLC, GB2405, K35

Confined compression tests (tests in which the sample is subjected to a vertical load, and is laterally confined during compression so that the displacements are kept at zero) were performed during 1959 and 1960 at Camp Fistlench and DYE 3, both in Greenland, and in the cold rooms of the former USA CRREL Laboratory in Wilmette, Illinois. Of special interest were the densification characteristics of a snow mass when subjected to loads transmitted by point bearing piles. Experimental procedures and equipment are described. Test samples were formed by forcing a rotating serrated tube into 3-in. snow cores obtained by the CRREL auger. The densities of the samples were determined. The applied loads ranged from 50 lb/in.<sup>2</sup> to 400 lb/in.<sup>2</sup> in the Camp Fistlench tests, 10 lb/in.<sup>2</sup> to 50 lb/in.<sup>2</sup> in the DYE 3 tests, and 12 lb/in.<sup>2</sup> to 40 lb/in.<sup>2</sup> in the laboratory tests. A typical set of deformation vs. time curves from these tests is shown. An analytical expression which describes the process of snow densification under lateral confinement was formulated, which closely fits data from confined compression tests. The process of snow densification during a confined compression test under constant unit load is described. It is pointed out that upon application of the load, within the stress range of the previous tests, the initial snow structure collapses, and the snow specimen undergoes an instantaneous densification. -- BLE

SIP 22073

551.321.2:622.231(494)

Haefeli, R.  
CUT-AND-FILL TECHNIQUE IN THE ICE TUNNEL  
OF THE TELEVISION-RELAY-STATION ON THE  
JUNGFRAUJOCH. p. 613-618 incl. table, graph,  
diagrs. (In: W. D. Kingery (ed.). Ice and Snow;  
Properties, Processes, and Applications. ...  
Cambridge, Mass., M.I.T. Press, 1963). 6 refs.  
DLC, GB2405, K35

A method is described of periodically correcting the displacement of an ice tunnel axis caused by glacier movement, without greatly disturbing the tunnel traffic and without machines. The character of the three-dimensional displacement of the axis is described. The tunnel length is 136 m, its greatest inclination is 15%, the light space profile is 1.80 by 2.10 m, and the overlying ice varies from 25 to 30 m. Steuri's pickaxe was the only instrument used. It must be made of good steel. The pointed end of the pickaxe, sharpened like a knife to the end, should not be hardened. The brittle ice must be loosened by swift and light blows. As a result of the displace-

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ment of the tunnel axis, the tunnel has to be moved in certain time intervals. The principle of this correction consists of widening and excavating the tunnel profile in the direction opposite to the glacier movement and upward in the direction of the streamline. A large part of the material broken off in this action will be used again in the same cross profile. The material, which consists of ice splinters and debris, hardens quickly. At temperatures below 0°C, the hardening can be accelerated by sprinkling the ice with water. -- BLE

SIP 22074

551.321.2:622.26:539.37(\*38)

Waterhouse, R. W.  
PLASTIC DISTORTIONS OF UNDERSNOW CAVITIES AND EXCAVATIONS. p. 619-629 incl. illus., graphs, diagrs. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963).  
DLC, GB2405, K55

This report describes the state of the art of determining the plastic deformation of cavities in snow and deductions from such studies. At Site 2, in Greenland, a system of undersnow cavities and excavations was made in 1954, 1955, and 1956, and instrumented to permit periodic measurements of mass movement. The densification of this 30 m of snow has been progressing in rough agreement with theoretical predictions on the densification of an undisturbed snow mass. The presence of this cavity does not appear to have influenced the natural densification rate for a seven-year period. Only summer readings of the movement were made. Continuous records of such movements were first made in 1958, and first evidence of long-time seasonal variations of creep rate in natural snow came from measurements of the vertical densification of the sidewall and crown-to-floor convergence of the first cut-and-cover trench produced in 1956. The relationship to time of the final equation for the convergence of the roof and floor of these trenches is described, and typical undercut trenches, methods, and movement measurements in the Camp Century complex are discussed. It is emphasized that the complexity of snow densification is real, and any theorizing is vulnerable because the mechanics of the undisturbed profile are not yet adequately understood. -- BLE

SIP 22075

551.324.414(\*49)

Mayo, Lawrence and Troy L. Péwé  
ABLATION AND NET TOTAL RADIATION, GULKANA GLACIER, ALASKA. p. 633-643 incl. tables, graph, map. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 31 refs.  
DLC, GB2405, K55

See SIP 20263.

SIP 22076

624.144.536

de Quervain, M. R.  
DESSOLUTION OR PREVENTION OF ICE CRUSTS. p. 644-652 incl. table, graphs. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 1 ref.  
DLC, GB2405, K55

This paper is based on the basic knowledge of the interaction between various salts (sodium and magnesium chlorides; wet and dry calcium chloride) and ice, and the results of experiments referring to the theory with emphasis on combatting alippiness on roads. Included in the discussion are (1) the freezing of aqueous salt solutions (described by a phase diagram), (2) the prevention of icing, (3) the dissolution of ice crusts, (4) the calculation of equivalent and eutectic quantities of salt, (5) balance and exchange of energy in the dissolving process, (6) calculation of the time necessary for dissolving an ice crust, and (7) the mechanism of the dissolving process. The formation of an ice crust on a solid base can be prevented down to a given temperature by applying an "equivalent" quantity of salt calculated from the phase diagram of salt-ice solution for the given temperature. Sodium chloride is the most advantageous salt for preventing crusts. For dissolving an ice crust, the "equivalent" quantity of salt is theoretically sufficient, but the process will take an infinite time unless special heat sources are available. Salts with positive heat of solution are best for quick dissolution of a crust. Figures and formulas given can also be applied to snow crusts. -- BLE

SIP 22077

624.139.62:624.15

Ward, W. H.  
PROTECTION OF GROUND FROM THAWING BENEATH SURFACE BUILDINGS. p. 653-665 incl. tables, graphs, diagr. (In: W. D. Kingery (ed.). Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 8 refs.  
DLC, GB2405, K55

Methods are presented of designing normal buildings for construction in permafrost regions. One method, which has been used with small buildings, consists of placing a layer of free-draining gravel or coarse sand over the site. The gravel is used in addition to a nominal amount of floor insulation and is placed as an elevated terrace to extend well beyond the edges of the building. Another method, which is an economic necessity for large buildings, is to provide a ventilated cavity between the floor and the ground. In this case the floor insulation should be sufficient to keep the heat loss the same as for the exposed parts of the building. Where the active layer of the ground is subject to significant seasonal frost heave, it may be necessary to place a gravel terrace beneath the ventilated cavity to prevent seasonal movements from affecting the building. A water vapor barrier must

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be placed on the inner side of the floor insulation immediately beneath the floor finish, otherwise the insulation may become saturated with water and ice. Approximate solutions are given for the insulation-thickness problems, and a system of equations is presented which describes the protection of the ground from thawing by a ventilated cavity. -- BLE

SIP 22078 621-496:629, 139:551, 322

Grove, C. S., Jr., S. T. Grove and A. R. Aldun  
THE THEORY AND USE OF AQUEOUS FOAMS FOR PROTECTION OF ICE SURFACES. p. 666-684 incl. table, graphs, diagr. (In: W. D. Kingery (ed.), Ice and Snow; Properties, Processes, and Applications. ... Cambridge, Mass., M.I.T. Press, 1963). 11 refs.  
DLC, GB2405, K35

The feasibility of aqueous foam as an insulating medium for ice was investigated with emphasis on the following problems: (1) insulation properties of foam (thermal conductivity), (2) stability and drainage of foam, (3) foam protection and melting, (4) foam generation, and (5) large scale foam tests. Thermal conductivity (determined by a method based upon the effect of the thermal conductivity of a medium on its unsteady-state heat transfer characteristics) ranges between 0.04 and 0.12 btu/hr/ft.<sup>2</sup>/F depending on the temperature and expansion ratio of the foam. Viscosity-increasing agents were used as stabilizers, and the drainage apparatus consisted of an aluminum pan positioned at a 15° angle so that all the liquid could drain out of the pan. A melting apparatus was constructed to screen the effectiveness of the various foam formulations. The foam generator consists of a gear pump and a Roots-Connorsville Blower. Two series of large-scale tests were conducted at the Climatic Laboratory of Eglin Air Force Base, Florida. Data indicate that aqueous foams are good ice insulators and that the best foam formulation consists of 6% Mearlfoam plus 4% Dow ET-460-6 or 4% CMC. Results calculated from the theoretical equation developed for the heat transfer through a foam layer compare well with experimental results. -- BLE

SIP 22079 551.462(\*30)

Ostenso, Ned A.  
PHYSIOGRAPHY OF THE ARCTIC OCEAN BASIN, p. 92-114 incl. maps. (In: Proc. 13th Alaskan Sci. Conf., April 25, 1963, College, Alaska).  
DLC, Q180U5A66

Earlier and recent bathymetric charts of the Arctic Ocean are discussed, and a chart has been constructed which is based upon all available Soviet and U. S. unclassified material. In the discussion of physiographic features, logical compromises are made in selecting geographic names. The term

"Arctic Basin" or "Arctic Ocean Basin" is used to refer to the entire complex of basins and shelves that contain the Arctic Ocean, and the deep-water sub-basins are called "deeps." The name Hyperborean Basin is applied to the ocean area on the American side of the Lomonosov Ridge and the region on the Eurasian side is called the Nansen Basin. Among the features described are the continental margin, the Makarov, Eurasia, and Fram Deeps, and the Alpha, Lomonosov, and Mid-Ocean Ridges. Within the boundaries of the Arctic Ocean are depressions of truly oceanic depths underlain by crustal sections 6 km thick. In addition, large volumes of sediments have collected within the basin and undergone "continental" deformation. Where in the earth's tectonic framework this ocean basin fits is still open to speculation. -- BLE

SIP 22080 551.333.5(\*49)

Hume, James D. and Marshall Schaik  
THE EFFECTS OF ICE-PUSH ON ARCTIC BEACHES. Amer. J. Sci. 262:267-273 incl. illus., diagrs., maps, Feb. 1964. 10 refs.  
DLC, Q1.A5

Pack ice along the northern Alaskan coast is commonly pushed on to the beaches where it striates, planes, gouges, and after melting, leaves deposits in the form of mounds or ridges. These ice-pushed ridges are usually 2 ft high but may reach 15 ft. The deposits probably do not form more than 10% of the beach material above sea level; 1 to 2% is typical. (Authors' abstract)

SIP 22081 69.039:091.6

Dykens, J. E., G. E. Sherwood and C. R. Hoffman  
POLAR STRUCTURES - THE NCEL FAMILY OF WANIGANS. Tech. Rept. R-309, U.S. Naval Civil Eng. Lab., 48p. incl. illus., tables, graph, diagrs., appendices, A-D, June 9, 1964. 9 refs. (Task Y-F015-11-01-144)  
DLC, Tech. Rept. Collection

This report describes the development and evaluation of two sled-mounted wanigans for trail use in polar regions and two skid-mounted wanigans for transient field camps and construction sites away from an established polar station. Utilities developed for the wanigans are also described and evaluated. The basic wanigan is the Standard NCEL (Naval Civil Engineering Laboratory) Sled Wanigan, which is 8 ft wide and 20 ft long. A 10-ft version of this wanigan is called the Extra-Wide NCEL Portable Camp Wanigans. All are of a prefabricated, panelized construction with interchangeable components. The two standard wanigans are air-transportable in a C-130 aircraft; the two extra-wide wanigans must be disassembled for shipment in this aircraft. A basic heating and ventilating kit, an electrical harness, and a side-mounted fuel storage tank were developed

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for the wanigans. These are adequate for most general applications. Tests demonstrated that the sled wanigans are well suited for housing the facilities required on sled train operations in polar regions, and that the portable camp wanigans are well suited for housing those facilities required at transient field camps and isolated construction sites. (Author's abstract, modified)

Naval Civil Engineering Laboratory. The roof panels are supported on steel trusses made up of 3 sections bolted together. A prototype 28- by 56-ft building was evaluated. Heating studies were conducted in a controlled climatic laboratory. The prototype was then outfitted as a 10-bedroom quarters and shipped to Hallet Station, Antarctica, for an in-service test. It was concluded that the building is suitable for housing personnel in temporary polar camps. (Author's abstract, modified)

SIP 22082

06,055:061,6:551,32(+484,2)

MacDonald Physics Laboratory, McGill University ANNUAL REPORT 1963. Rept. G-10, 19p. incl. table, Jan. 21, 1964. 8 refs. (Contract HQ DEV 35; Proj. No. D45-95-10-09)  
DLC, Tech. Rept. Collection

All of the work of the Project during 1963 is described. The micrometeorological equipment of the Project was increased by the purchase of a system for measuring humidity using lithium chloride cells. Considerable testing and modification of this equipment was done preparatory to setting up a station on the ice of Tanquary Fjord, Ellesmere Island, N.W.T. in the spring and summer of 1964. The object is to study the magnitudes of the various energy fluxes between the ice and the atmosphere during the decay of sea ice. A first, partially successful attempt to study the movement of ice in this fjord using time-lapse photography was made in the summer of 1963. Work on the electrical conductivity and dielectric coefficient of sea ice was continued. Measurements taken confirm that the apparent dielectric coefficient is extraordinarily large at audio frequencies. The study of the use of gravity measurements to find glacier depths was completed. The instrumental work on a method of generating shear wave pulses for finding the transit time of a shear wave in ice was finished also. Preliminary laboratory measurements on Poisson's ratio for sea ice, using this equipment, do not agree with the values found in earlier field work using a resonance technique. (Authors' abstract, modified)

SIP 22084

551,579.2(52)

Nakahara, Kenji  
SNOW MELTING PROMOTION BY CARBON BLACK. (Yūsetsuyō kābon burakku; Text in Japanese). Tanso (Carbons), No. 37:17-20 incl. illus., tables, graphs, Feb. 1964. 6 refs.  
DLC, Orientalia Div.

The use of carbon black to promote snow melting was studied in the Niigata and Yamagata Prefectures. Carbon black (specific wt 1.9, maximum particle diam. 0.5  $\mu$ , and pH 7.2) was spread on 2 snow-covered fields (each 10 x 10 m in area) in quantities of 0-40 g/m<sup>2</sup> when snow accumulation was 140-170 cm. No significant increase in snow melt was observed when carbon black was increased beyond 10 g/m<sup>2</sup>; however, 5 g/m<sup>2</sup> was insufficient. It is concluded that 10 g/m<sup>2</sup> is sufficient for ordinary snow depths; 20 g/m<sup>2</sup> should be used for very deep snowfalls. Spreading in strips is most effective when no more snow is expected. -- CST/BLE

SIP 22085

551,578.41(52)

Takahashi, Tsutomu  
CHEMICAL COMPOSITION OF SNOW IN RELATION TO THEIR [sic] CRYSTAL SHAPES. (Yuki no katachi to kagaku seibun; Text in English). J. Meteorological Soc. Japan, 41(6):327-336 incl. illus., table, graphs, Dec. 1963. 14 refs.  
DLC, Orientalia Div.

Snow samples were collected according to crystal type at Kitamoshiri, Japan, 600 m above sea level and far from industrial areas. To collect the samples, a vinyl sheet (2 x 2 m) was spread on the surface of ground snow. When an appropriate amount of snow had been collected or when the shape of the crystals falling was observed to change, the snow on the sheet was put into a vinyl sack and kept in an igloo. Snow crystals collected were classified into several groups which include dendrite, rimed-dendrite, column-partly rimed, and graupel crystals. Formvar solution was used to prepare replicas of the snow crystals. Chemical analysis was made to detect Cl, Na, NH<sub>4</sub>, SO<sub>4</sub>, Mg, Ca, NO<sub>3</sub>, Fe, and Si. Cl, Na, and NH<sub>4</sub> concentrations were low in columnar crystals, but the quantity increased with a decreasing proportion of columnar crystals to dendritic

SIP 22083

685,532:69,002,2(+2)

Sherwood, G. E.  
TEMPORARY POLAR STRUCTURES - MODIFIED T-5 BARRACKS. Tech. Rept. R-308, U. S. Naval Civil Eng. Lab., 25p. incl. illus., table, diagrs., appendixes A-C, May 21, 1964. 6 refs. (Task Y-F015-11-01-149)  
DLC, Tech. Rept. Collection

A building for quartering personnel in temporary polar camps was developed. The building of modular panel design is 28 ft wide, has a 9-ft ceiling, and is expandable in length on a 4-ft module. It was designed by the U. S. Army Engineer Research and Development Laboratories, Fort Belvoir, Virginia and equipped with a steel-beam foundation by the

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crystals.  $\text{NH}_4$  was most abundant in dendritic crystals, and the concentrations of Cl and Na were largest in graupel. The relative concentration of the chemical elements of graupel was close to that of sea water. -- BLE

SIP 22086 551, 322:539, 67:541, 6

Kuroiwa, Daisuke  
INTERNAL FRICTION OF ICE. I. THE INTERNAL FRICTION OF  $\text{H}_2\text{O}$  AND  $\text{D}_2\text{O}$  ICE, AND THE INFLUENCE OF CHEMICAL IMPURITIES ON MECHANICAL DAMPING. Contrib. Inst. Low Temp. Sci. (Sapporo, Japan), Ser. A, No. 18:1-37 incl. illus., graphs, diagrs., 1964. 15 refs.  
DLC, Orientalia Div.

The internal friction of pure  $\text{H}_2\text{O}$ ,  $\text{D}_2\text{O}$  ice and contaminated ice crystals containing various chemical impurities such as NaCl, HCl, NaOH, HF and  $\text{NH}_4\text{F}$  were measured between  $0^\circ\text{C}$  and  $-180^\circ\text{C}$  by the flexural vibration method. Internal friction is expressed as a logarithmic decrement in free oscillation. The vibration apparatus was placed in a cold box which could be refrigerated with liquid oxygen or nitrogen. Two rectangular ice bars cut from the same ice block, trimmed to the same dimensions, and cooled at the same rate, were used for temperature determination and mechanical damping. Equations are given for the logarithmic decrement, internal friction, and the resonant frequency of a rectangular bar. A special electronic device was used to measure the logarithmic decrement. The following results were obtained: (1) in pure  $\text{H}_2\text{O}$  and  $\text{D}_2\text{O}$  ice, a typical relaxation curve was observed showing the same value for the activation energy (13.1 kcal/mole) as for the dielectric relaxation, (2) in doped ice crystals, the activation energy was reduced to about half of the pure ice value, (3) another damping maximum due to aggregated impurities appeared around  $-145^\circ\text{C}$  in NaCl- and HCl-doped ice, (4) this maximum decreased with annealing, and (5) fluoride-doped ice crystals also exhibited an annealing effect on the relaxation curve. (Author's abstract, modified)

SIP 22087 551, 322:539, 67:548, 4

Kuroiwa, Daisuke  
INTERNAL FRICTION OF ICE. II. THE GRAIN BOUNDARY INTERNAL FRICTION OF ICE. Contrib. Inst. Low Temp. Sci. (Sapporo, Japan), Ser. A, No. 18:38-48 incl. illus., graphs, diagrs., 1964. 3 refs.  
DLC, Orientalia Div.

The mechanism responsible for grain boundary internal friction was determined. The grain boundary internal friction of ice grown from a melt was measured by cutting blocks containing individual crystal boundaries from polycrystalline ice and inlaying

these in single crystal bars. This friction differs from boundary to boundary and is not always proportional to the total area of the boundaries but depends upon concentrated chemical impurities. The activation energy for grain boundary viscosity, was estimated at 60 to 70 kcal/mole for pure  $\text{H}_2\text{O}$  and  $\text{D}_2\text{O}$  ice, assuming that the shift of observed curves of  $\tan \delta$  toward the high temperature range with increasing frequency is due to anelasticity at grain boundaries. The values for NaCl-doped ice crystals decreased from 60 to 30 kcal/mole with an increase in the concentration. -- BLE

SIP 22088 551, 324:539, 67

Kuroiwa, Daisuke  
INTERNAL FRICTION OF ICE. III. THE INTERNAL FRICTION OF NATURAL GLACIER ICE. Contrib. Inst. Low Temp. Sci. (Sapporo, Japan), Ser. A, No. 18:49-62 incl. illus., graphs, diagrs., 1964. 4 refs.  
DLC, Orientalia Div.

The internal friction of glacier ice was measured on specimens obtained from Antarctica, Greenland, and Le Conte Glacier, Canada. Distinctively different curves were obtained for the specimens from various localities, and these differences can be attributed to: (1) environmental conditions at the time of formation, and (2) the environmental conditions that acted on the sample from the time of formation until the time of sampling. A reasonable explanation for the configuration of the glacier ice curves was made upon comparison with the experimental results from earlier work with pure and doped ice crystals (See SIP 22086). (Author's abstract, modified)

SIP 22089 624, 139, 2:625, 1

Dalmatov, Boris Ivanovich and Georgi Mikhailovich Shakhnyants  
FROST HEAVING OF SOIL AND ITS INFLUENCE ON FOUNDATIONS AND RAILWAY FORMATIONS. p. 55-59 incl. illus., graphs. (In: Proceedings, 5th International Conference on Soil Mechanics and Foundation Engineering, Paris, Vol. 1, 1961). 9 refs.  
DLC, TA710.I52

Laboratory experiments conducted on a sample of frozen soil revealed that the bed is warped initially when the frozen zone is less than 0.3 m thick and that this is followed by a continuous slide (0.2-20 mm/24 hr) of frozen soil across the lateral surface of a foundation when maximum upheaval force is developed. An increase in pressure (measured by an automatic beam press) was first noted with no substantial movement. Heaving irregularities on railways are differentiated as heave elevations, depressions, and drops, all of local origin. The intensity of the frost heave formation must be determined with depth for each section of line. A system of equations

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is given for determining stable resistance of freezing and upheaval forces in a merging active bed, and curves are presented showing distribution of heaving intensity in relation to depth. A curve can be obtained by directly determining the average value of heaving of each layer into which the entire freezing zone is divided with a marginal allowance. Another method is to calculate the intensity of heave formation by the measurement of the moisture content of the layers before the soil thaws. -- BLE

SIP 22090

624.131:551.343.7

Keinonen, L. S.  
MOISTURE MOVEMENT IN SOIL UNDER FROST ACTION. p. 189-190 incl. diagr. (In: Proceedings, 5th International Conference on Soil Mechanics and Foundation Engineering, Paris, Vol. 1, 1961). 3 refs.

DLC, TA710.I52

An experiment using silty clay was conducted in a freezing box similar to that used by Beakow. After the specimen was allowed to freeze completely, the addition of moisture was stopped. The temperature of the upper end of the specimen was kept below that of the lower end, permitting frost heave to be observed for several days. When the specimen froze normally while receiving water, the heave was 30-50 mm/day. After 10 days, frost heave was 0.004-0.015 mm/day when the temperature gradient was 0.5° C/cm and the temperature in the upper half of the specimen was -4° C. Continued frost heaving after discontinuing the addition of water was due to the fact that the water film held by the soil particles was thinner in the upper part. As a result, moisture movement took place from the lower to the upper area; the water froze upon arrival. After 11 days the temperature was abruptly lowered causing an acceleration in the moisture movement and the frost heave. The amount of liquid water rapidly diminished and frost heave stopped. The most important factor responsible for the moisture movement is the "jack effect," whereby ice crystals, in active spots growing larger than the soil pores, lift the overlying soil layer where no active ice crystal growth proceeds. -- BLE

SIP 22091

624.139:624.133

Tsyrovich, N. A.  
GROUND FREEZING APPLIED TO MINING AND CONSTRUCTION. p. 737-741 incl. illus., graphs, diagr. (In: Proceedings, 5th International Conference on Soil Mechanics and Foundation Engineering, Paris, Vol. 2, 1961). 10 refs.

DLC, TA710.I52

Two successful applications of the artificial freezing method of sinking deep escalator shafts for under-

ground railways and protecting foundations from powerful streams of ground water are described; formulas are given for determining the freezing time and time of closing of ice-soil cylinders; and methods of calculating strength and creep of temporary ice-soil barriers are substantiated. Among the factors to be considered when solving soil freezing problems are crystallization of free water, further partial freezing of bound water as the temperature is lowered below zero, and changes in the humidity and thermo-physical properties of the ground. A study of the mechanical properties of soils necessitates distinguishing between maximum strength, reduction in strength with time, and minimum strength. Strength may be calculated by the theory of tangential stresses (More), according to which the limiting resistance to shear is a function of normal stress and depends on the temperature and time of action of the load. Calculations of ice-soil barriers on the basis of permissible deformation due to creep are best made with the theory of strength (Mizes-Botkin). This theory is based on the dependence of the intensity of shear stress on the intensity of deformations of shear. Examples are cited to illustrate these principles. -- BLE

SIP 22092

663.63:551.464.88:536.421.4

Fischbeck, Kurt H.  
PRINCIPLES OF FREEZING FOR DESALTING SEA WATER. (Grundlagen der Gefrierverfahren zur Gewinnung von Süßwasser aus dem Meer; Text in German with English, French, and German summaries). Dechema Monographien, 47(805-834):755-776 incl. illus., table, graphs, diagrs., 1962. 21 refs.

DLC, QD53.D45

The phenomena which form the basis of fresh water extraction from sea water by freezing are nucleus formation, crystal growth, and thermal and mass diffusion from the growth surface into the remaining solution. These phenomena lead to problems of a physico-chemical nature. The flow of energy and material through the purification plant involve problems which are typical of process engineering. With the aid of examples, it is shown how the problems which arise can be overcome. (Author's abstract, modified)

SIP 22093

663.63:551.464.88:536.421.4

Messing, Theodor  
NEW METHODS OF PURIFYING SEA WATER BY FREEZING. (Neue Methode zur Gewinnung von Süßwasser aus Meerwasser durch Ausfrieren; Text in German with English, French, and German summaries). Dechema Monographien, 47(805-834):793-804 incl. graphs, diagrs., 1962. 4 refs.

DLC, QD53.D45



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A process is described in which sea water is evaporated under vacuum at  $-2^{\circ}\text{C}$ , resulting in the formation of salt-free ice crystals. The corresponding vapors are condensed in direct contact with a suitable absorbent, and the heat of condensation is used to melt the ice. The supplementary heat introduced into the process is eliminated in a refrigerator. The water taken up by the absorbent is drawn off in a multiple-effect evaporating plant, thus regenerating the condenser liquid. This method promises a considerable decrease in drinking water production cost, never before achieved in an industrial plant. (Author's abstract, modified)

SIP 22094 663.63:551.464.88:536.421.4

Panković, Živan  
FRESH WATER FROM THE SEA. (Süßwasser aus dem Meer; Text in German with English, French, and German summaries). Dechema Monographien, 47(805-834):805-814 incl. tables, diagrs., 1962.  
DLC, QD53.D45

The basic method of producing fresh water from the sea by freezing is described and compared with other processes. It is stressed that the originality of the Metallurgical Institute's (Yugoslavia) process is in obtaining ice crystals in the form of fine snow by using a specially constructed hollow stirrer, and in removing the mother liquid from the crystals by centrifugation. This is followed by a short review of scientific research from normal laboratory work to a semi-industrial pilot plant. The process of semi-industrial cooling of sea water, and its concentrates are described. The results obtained by centrifugation are tabulated. A sketch of a projected plant with a capacity of 800-1000 l. of freshwater per hour is included. (Author's abstract, modified)

SIP 22095 663.63:551.464.88:536.421.4

Okabe, Toyohiko  
ON THE DESALTING EXPERIMENTS BY FREEZING PROCESS EMPLOYING SEMI-INDUSTRIALIZED SCALE EQUIPMENT IN JAPAN. Dechema Monographien, 47(805-834):815-821 incl. illus., table, diagrs., 1962.  
DLC, QD53.D45

A 60-hp desalting apparatus was developed which features improved freezing efficiency, a better separation process, and continuous operation. The equipment consists of a simple device with a revolving drum, a separator, and a heat exchanger. Ice forms on the surface of the cylinder of the revolving freezer. The cylinder is made of stainless steel plate, 6 mm thick. The ice is stripped easily from the surface of the cylinder by a vinyl edge. The ice is kept in a hopper for 5 to 60 min and is separated by a con-

tinuous centrifugal machine. The ice mixture (kept in equilibrium by an electromagnetic vibrator) is removed to the centrifugal separator by a screw conveyor. The salt concentration of the ice is 200 to 2000 p.p.m. Fresh water is produced at the rate of 31.1 kg/kwh. Total input power required is 60 kw. -- BLE

SIP 22096 663.63:551.464.88:536.421.4

Trépaud, Georges  
DESALTING SEA WATER BY FREEZING. (Déméralisation de l'eau de mer par congélation; Text in French with English, French, and German summaries). Dechema Monographien, 47(805-834):823-828 incl. table, 1962.  
DLC, QD53.D45

This process consists of 2 stages: fractionated ice formation, and fractionated melting of this ice. The ice is obtained in a Trépaud system tubular exchanger in which the brine circulates. It accumulates in the form of hollow cylinders, 4 cm in diam. Partial melting of the ice is effected by a current of warm air when the brine is drained off. In the case of brackish water, this partial melting stage is omitted. A plant of small capacity (40 kg/h) was developed which is suitable for small isolated requirements. (Author's abstract, modified)

SIP 22097 663.63:551.464.88:536.421.4

Döge, Friedemann  
FRESH WATER FROM THE SEA BY THE FREEZING PROCESS. SPECIAL SALT-ICE SEPARATION BY CENTRIFUGATION. (Süßwassergewinnung aus dem Meer mittels Gefrierverfahren, speziell Eiskristall-Sole-Trennung durch Zentrifugieren; Text in German with English, French, and German summaries). Dechema Monographien, 47(805-834):829-838 incl. table, graphs, diagrs., 1962.  
DLC, QD53.D45

Methods of separating fresh-water ice crystals from brine by centrifugation are outlined and centrifuges which may be used for this purpose are described. For laboratory tests, a suspension of 4% NaCl and powdered snow was used. The snow crystals were 0.5-2.0 mm in size. Industrial tests were carried out with a suspension of crystals of uniform size and structure. Three types of centrifuges are recommended: (1) the oscillation, (2) the peeler, and (3) the pusher. The oscillation centrifuge is the most economical. -- BLE

# CRREL BIBLIOGRAPHY

SIP 22098

663, 63:551, 322:536, 421

Adams, Clyde M. and Pradeep K. Rohatgi  
SOLIDIFICATION AND SEPARATION OF ICE FROM  
SALINE WATER. Res. and Development Prog. Rept.  
No. 94, Mass. Inst. Tech., Cambridge, 36p. incl.  
illus., graphs, March 1964. 4 refs.  
OTS, PB 181591

This investigation describes the mechanism of solidification of aqueous solutions and the effects of externally applied electrical and magnetic fields on solidification. Aqueous solutions of ionic salts freeze by the separation of pure ice crystals from the liquid phase. In one respect, the growth rate of an individual crystal or dendrite within the aggregate is governed by mass transport, but, on a larger scale it is determined by heat transfer. Electrical fields influence solidification patterns by (1) restricting ion movement to certain preferred directions, (2) the interaction of electrical and magnetic fields, (3) influencing structure and short-range order in the liquid state, thereby modifying the ability of the solution to withstand supercooling, and (4) by altering the character of the liquid-solid interface. Upon fast solidification, binary and ternary solutions freeze with the production of groups of parallel plate-shaped dendrites. An increase in solute concentration causes an increase in dendrite spacing and alters plate structure; electrical and magnetic fields have a similar effect. Magnetic fields exert less influence, when freezing is initiated from a solid chill surface and takes place under gradient conditions, than when freezing rates are uniform. Under conditions of gradient freezing, dendrite spacing adjusts with freezing rate but hysteresis effects tend to oppose this change. -- BLE

SIP 22099

663, 63:551, 322:536, 421, 4

Sherwood, T. K. and P. L. T. Brian  
RESEARCH ON SALINE WATER CONVERSION BY  
FREEZING. Res. and Development Prog. Rept. No.  
96, Mass. Inst. Tech., Cambridge, 37p. incl.  
graphs, diags., March 1964. 20 refs.  
OTS, PB 181593

This progress report discusses the theory, apparatus, and findings of 3 investigations. (1) A Study of the effect of salt build-up at a phase boundary across which water, but not salt, is removed from brine. This phenomenon is encountered in solvent extraction and reverse osmosis, as well as in the freezing process. (2) An experimental and theoretical study of the removal of brine from ice-brine "slush" by counter-current washing. (3) A basic study of the effect of additives on crystallization of super-cooled water. -- BLE

SIP 22100

551, 324, 63:581, 524, 323, 1(\*57)

Stork, Adelaide  
PLANT IMMIGRATION IN FRONT OF RETREATING  
GLACIERS, WITH EXAMPLES FROM THE  
KEENEKAJSE AREA, NORTHERN SWEDEN.  
Geografiska Annaler, 45(1):1-21 incl. illus., tables,  
graphs, diag., appendix, 1963. 30 refs.  
DLC, G25.G4

The process of plant colonization and succession in front of receding glaciers was studied in order to determine the length of time that morainic deposits in similar areas have been exposed. A short historical review of studies of recessional moraines, and methods of determining the age of morainic debris are given. The area studied is described. Flora and vegetation successions, lichenometrical results, and soil development are among the topics discussed. The annual retreat of a glacier can be traced from photos or records made by visitors. Other methods include studying the vegetation pattern, measuring the diameters of the largest thalli of certain crustose and umbilical lichens in an area of known age (the lichenometric method), and determining the organic content and acidity of the soil. A definite age is not given of the exposed morainic surfaces in the Kebnekajse area but the development of the moraines in the Tarfala region, northern Sweden, are compared with that in Jostedalssbre, South Norway. A summary of lichenometrical studies and an annotated bibliography are given in the appendix. -- BLE

SIP 22101

551, 331, 5(\*57)

Hoppe, Gunnar  
SUBGLACIAL SEDIMENTATION, WITH EXAMPLES  
FROM NORTHERN SWEDEN. Geografiska Annaler,  
45(1):41-51 incl. illus., graphs, diags., map,  
appendix, 1963. 22 refs.  
DLC, G25.G4

Sediment plateaus are described near an extensive area of Veiki moraine in the southeastern part of Jokkmokk township, to the east of Rahanäive hill on both sides of the railway between Jokkmokk and Arvidsjaur, and at Pälkäive hill. The plateaus at Rahanäive and Pälkäive are morphologically much alike and closely related genetically. Both differ from the Veiki moraine plateaus in several ways, e.g., they lack the rim ridges which are typical of the latter. The facts suggesting that the plateaus consist of stratified drift are the flat-topped plateau morphology, the presence of sediments and circular kettles, the dissection of the Rahanäive plateaus by extensive gully systems, and the data from the seismic investigations. In most places the plateaus are covered by till at least 1 m thick. The origin of the inter-plateau valleys is not clear. They were probably connected with each other originally and dissected by meltwater streams at a late stage of deglaciation. The sediment plateaus were built up in large subglacial (or englacial) cavities which were formed by meltwater activity. The seismic investiga-

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tions are discussed in the appendix in a short article by Stig-Rune Ekman. -- BLE

SIP 22102 551.524.3:551.324(\*7)  
551.582(\*7)

Sabbagh, Michael E.  
SEASONAL AND REGIONAL VARIATIONS OF TEMPERATURE OVER THE ANTARCTIC CONTINENT DURING 1958. *Geografiska Annaler*, 45(1):52-75 incl. tables, graphs, map, 1963. 17 refs.  
DLC, G25.G4

The annual march of temperature over the Antarctic continent is examined in terms of its regional and seasonal characteristics. The analysis is based on a reliable set of homogeneous data which were gathered at the 7 U. S. Antarctic stations during 1958. Weather and climate at the surface result from motions in the atmosphere above, which take place in the vertical and horizontal dimensions. The variations of temperature within the surface inversion of cold air result from the radiation effects of clouds, cold and warm air advection, and atmospheric disturbances which occasionally break down the surface inversion. The distribution of temperature in the troposphere at each station is presented by 5-day means showing the time cross-sections at the 500 mb level, monthly standard deviations of daily temperature at the 700, 500 and 300 mb levels, and correlation coefficients of the 5-day temperature trends between the 300, 500 and 700 mb surfaces at each station. The high East Antarctic plateau is cloaked in a veneer of cold air for over 80% of the year. This veneer is 300 m deep and is characterized by steep surface inversions. Temperature regimes at the surface and in the lower troposphere are characterized by large aperiodic fluctuations which occur over vast areas and through deep layers of the atmosphere. -- BLE

SIP 32103 624.144.58:629.139(73)

Drake, John W. and Robert L. Schein  
BENEFIT COST ANALYSIS OF AIRPORT SNOW, ICE, AND SLUSH REMOVAL. Final Rept., Contract No. FA-WA-4685, Systems Analysis and Res. Corp., Boston, Mass. and Wash., D. C. 141p. incl. tables, graphs, appendixes A-G, March 1964. 8 refs.  
DLC, GPRR

This analysis deals with the economic impact of snow, ice, and slush removal operations at 8 major U. S. airports. The research approach included on-site interviews and operational simulation. Estimates were made of the costs incurred by airport operators and users as a result of clearing operations during the winter of 1962-1963 and as forecast for 1975. It was estimated that the total cost to operators and users of clearing operations in 1962-1963 was

\$900,000. In 1975 the cost will be 3-4.5 million dollars depending on reasonable variations in weather conditions. The total cost to airport users is 5 to 6 times that imposed on the airports. It was found that a significant reduction in these costs could be effected by increasing the removal capacity and the tolerable limits of snow and slush accumulation. (Authors' abstract, modified)

SIP 32104 061:551.32:551.345.1:551.48(510)

Ya-feng, Shih  
CHINESE RESEARCH ON GLACIOLOGY, PERMAFROST AND ARID LAND HYDROGRAPHY THE PAST FIVE YEARS [sic]. (Wu nien lai te Chung-kuo ping ch'uan hsieh, tung t'u hsieh yu kan han ch'u shui wen yen chiu; Text in Chinese). K'o-hsueh Tung-pao (Scientia), No. 3:218-225, March 1964. (Eng. transl.: Dept. of Commerce, Office of Tech. Services, Wash. 25, D. C., JPRS: 23,018, June 10, 1964)  
DLC, Orientalia Div.

Research in Communist China during the last 5 yr (1958-1963) has resulted in the following achievements. (1) A basic survey was made of glacier distribution, morphology, water storage volume on Ch'i-lien Shan, T'ien Shan, the Mu-shi-t'a-ko - Kung-ko'erh Shan highlands, and the distribution and numbers of recent glaciers and permanent snow cover throughout China were estimated. (2) The extreme continental characteristics of glaciers in the arid Northwest were uncovered. (3) The complementary action of melted glacial water on rivers in the Northwest was observed and measured. (4) Experience was obtained in tapping and utilizing water sources of Alpine ice and snow through melted ice and snow experiments. (5) Ancient glacial remnants were surveyed and the historical evolution of glaciers was explored. (6) Perennial permafrost distribution, characteristics, and causative factors were investigated along the Tsinghai - Tibetan Highway. (7) Many types of water sources were discovered apart from the Alpine glaciers, and the basic pattern of formation and transformation was studied of transient streams at the headwaters of the Urumchi River. (8) A flood prediction scheme was devised, and photographic measurement techniques for glacier research have been used. -- BLE

SIP 22105 550.385:551.564.5/.53(\*2)

Nagata, Takeo and E. Kameda  
AN INTER-RELATION BETWEEN AURORAL LUMINOSITY AND SIMULTANEOUS GEOMAGNETIC DISTURBANCES. Report of Ionosphere and Space Research in Japan, 16(4):410-414 incl. graphs, 1962. 8 refs.  
DLC, Unbound periodical

Numerical relationships between the luminosity of zenithal aurora (J) and magnitude of horizontal

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disturbance vector ( $\Delta H$ ) of simultaneous geomagnetic elementary storm were obtained at College and Point Barrow, Alaska, and Little America, using ASCA-Pagrams and magnetograms. The relationships are expressed as

$$\begin{aligned} J &= 5.6 \times 10^{-3} [\Delta H]^2 & KR/\gamma^2 \text{ at College;} \\ J &= 3.2 \times 10^{-3} [\Delta H]^2 & KR/\gamma^2 \text{ at Point} \\ & \text{Barrow; and} \\ J &= 0.4 \times 10^{-3} [\Delta H]^2 & KR/\gamma^2 \text{ at} \\ & \text{Little America.} \end{aligned}$$

The small value of the coefficient,  $J/[\Delta H]^2$ , for Little America is probably due to the condition in the area between the outer and inner auroral zones where the major parts of the overhead ionospheric currents (which are responsible for  $\Delta H$ ) are also the counter currents of the auroral zone electrojet. Therefore, the flux of the electron stream causes the auroral luminosity and ionization in the ionosphere to be much less than that in the auroral zone. A photoelectric analyzer of all-sky camera auroral photographs (ASCA-PA) was constructed to obtain a practically continuous record of luminosity of the white aurora in a certain area in the sky. Examples are graphed of ASCA-Pagrams and simultaneous magnetograms obtained at Little America, and diagrams are given which show the correlation between average green line luminosity  $J(5577)$  and horizontal disturbance vector at the 3 stations. -- BLE

SIP 22106

550.385:551.594.5/.53(\*2)

Oguti, Takasi  
INTER-RELATIONS AMONG THE UPPER ATMOSPHERE DISTURBANCE PHENOMENA IN THE AURORAL ZONE -- THE SPIRAL PATTERN OF THE POLAR AERONOMICAL DISTURBANCES. Report of Ionosphere and Space Research in Japan, 16(4): 363-386 incl. tables, graphs, diagrs., maps, 1962. 32 refs.

DLC, Unbound periodical

Spiral patterns of polar aeronomical disturbances (e.g. the loci of geomagnetic activity, maximum occurrence of  $E_s$  and blackout), maximum appearance of ordinary green aurora, and auroral hydrogen emission, are summarized. The physical origins of these spiral disturbance patterns are studied. It is concluded that (1) loci of  $\gamma$ -type  $E_s$ , night  $E$ , hydrogen emission, and broad bay-type geomagnetic disturbance may correspond to the precipitation trapped-proton zones in the exosphere, and (2) the loci of  $\alpha$ - and  $f$ -type  $E_s$ , ordinary green aurora and sharp negative bay correspond to the precipitation zones of trapped electrons which drift mainly because of the electric field in the exosphere. A trapping mechanism of particles into the geomagnetic cavity is proposed. (Author's abstract, modified)

SIP 22107

551.322:539.37

Wakahama, Gorow  
ON THE PLASTIC DEFORMATION OF ICE. V. PLASTIC DEFORMATION OF POLYCRYSTALLINE ICE. (Koori no sousei henkei ni tsuite. V. Takeshohyō no sousei henkei; Ta. t in Japanese with English summary). Teion-kagaku (Low Temp. Sci.), Ser. A, 22:1-24 incl. illus., graph, diagrs., March 1964. 6 refs.

DLC, Orientalia Div.

Two types of thin polycrystalline ice plates (some composed of a few large grains which were cut from commercial ice, and some of a large number of small grains which were cut from icicles) were compressed at  $-10^\circ\text{C}$  under a polarizing microscope to observe the deformation process occurring in each of the ice grains of the plates (See SIP 20456). Most of the grains were found to have undergone basal slip accompanied by rotation of the  $c$ -axis of the ice crystal in the deformation of the ice plate. The process of lattice bending and the formation of a bend plane are illustrated in a series of photographs. In an early stage of compression, many streaks parallel to the basal plane appeared in a sample grain. These streaks were visible only through polarized light, indicating they are a photoelastic phenomenon induced by strain. Evidence of slip was found along grain boundaries, which is attributed to the basal slip accompanied by the rotation of the  $c$ -axis of ice occurring in the right half of the grain. Also discussed are the formation of etch pits, which permits the determination of the crystallographic orientation of each grain, and the breakdown of the texture and recrystallization observed in the plates. (From author's summary)

SIP 22108

551.322:548.2

Kuroiwa, Daisuke  
SURFACE DAMAGE ON POLISHED ICE CRYSTALS REVEALED BY THERMAL ETCHING. (Netsufushokuhō de kansoku shita koori no kemmamen no mamō; Text in Japanese with English summary). Teion-kagaku (Low Temp. Sci.), Ser. A, 22:25-57 incl. illus., table, graphs, March 1964. 16 refs.

DLC, Orientalia Div.

Surface damage on polished ice crystals was studied by thermal etching. In a cold room maintained at  $-15^\circ\text{C}$ , an ice surface was smoothed with No. 320 and No. 400 corundum paper and then polished with a clean silk cloth or cotton gauze until a mirror-like surface was obtained. When the polished ice crystal surface was exposed to free air in the cold room, preferential evaporation occurred at various sites which had been subjected to damage during the polishing, and characteristic thermal etch patterns appeared in each grain. A thin solution of Formvar in ethylene dichloride was applied to reveal the crystallographic orientations. The type of surface damage varied with the polishing treatment. The azimuth angle of the etch channels which appeared

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on the basal plane was measured in reference to the a-axis, and the frequency curves were drawn against the azimuth angle divided into 2° intervals. The most frequent orientation of the etch channels was the azimuth between 13° and 20°. A qualitative description of the orientation of the etch channels is given in terms of ice crystal structure. (From author's summary)

SIP 22109 551.578.46:534.2

Ishida, Tamotsu  
ACOUSTIC CHARACTERISTICS OF [A] SNOW LAYER. (Sekisetsu no onkyō tokusei; Text in Japanese with English summary). Teion-kagaku (Low Temp. Sci.), Ser. A, 22:59-72 incl. graphs, diagra., March 1964. 9 refs.

DLC, Orientalia Div.

The sound transmission loss of a snow layer was measured using waves of various wavelengths. The attenuation constant through the snow layer was calculated from the variation of the transmission loss with the thickness of the sample. The attenuation constant  $\alpha$  in units of 1/cm is represented by  $\alpha = 0.003 \sigma + 0.00052 \sigma^2$ , where  $\sigma$  is the flow resistance of the sample in g/sec-cm<sup>2</sup>. The wave propagation was investigated on the surface of a snow cover, in a snow tunnel, and in a snow trench. Frequency-response curves of the attenuation constant through a snow sample and on a snow surface showed the same absorption characteristics. The attenuation constant through a snow sample is 100 times that of the surface. (From author's summary)

SIP 22110 551.321.82:539.376

Kinosita, Seiti  
OBSERVATION OF THE END SURFACE OF A SNOW CYLINDER COMPRESSED BY A TRANSPARENT PLATE. (Yuki o heiban de osu toki no sesshokumen no kansatsu; Text in Japanese with English summary). Teion-kagaku (Low Temp. Sci.), Ser. A, 22:73-82 incl. illus., diagra., March 1964. 4 refs.

DLC, Orientalia Div.

The upper end surface of a snow cylinder was observed from above by using a transparent compression plate (methacrylic acid resin). When compressed at a constant speed above a certain critical speed, the cylinder suffers contraction. Observations from the side revealed that the cylinder's end layers were broken down and squeezed out one after another. Before the experiment, a grid was drawn on the upper surface with ink. The ink lines began to disappear at the periphery of the specimen and the remaining portions of the ink lines broadened. As compression proceeded, several cracks appeared through the ink lines and the peripheral parts of the cylinder top split out. The loose snow at the top of the cylinder was gently removed, leaving a cone of

compacted snow. The microscopic observation of the texture of the cone showed that it was an aggregation of numerous small separated ice grains. (From author's summary)

SIP 22111

551.321.5:539.31

Yosida, Zyungō  
INTERNAL STRESS AND VISCOUS FLOW OF SNOW COVERS ON SLOPING GROUND SURFACES. I. SNOW COVER ON WAVY GROUND OF MEAN INCLINATION. (Shamen sekisetsu no naibu ōryoku oyobi nensei ryūdō. I. Hajō ni kifuku suru shamen no sekisetsu; Text in Japanese with English summary). Teion-kagaku (Low Temp. Sci.), Ser. A, 22:83-100 incl. tables, graphs, March 1964. 5 refs.

DLC, Orientalia Div.

The internal stress and flow velocity in snow cover is theoretically derived. For this purpose it is assumed that snow is an incompressible Newtonian fluid of uniform density in a steady flow state of plane strain. The problem is presented and explained by a system of equations which considers the relations between stress and flow velocity components, snow cover motion, boundary conditions, and the longitudinal tension or compression at the top surface of the snow cover. It is proved that a snow cover with a planar upper surface will flow down a wavy slope with steady velocity, retaining its planar upper surface despite the snow movement. It is assumed that this flow is unstable and that any disturbance of the upper surface of the snow cover will result in a transformation from a smooth surface to one more nearly corresponding to the ground surface contours. (From author's summary)

SIP 22112

551.321.5:539.31

Yosida, Zyungō  
INTERNAL STRESS AND VISCOUS FLOW OF SNOW COVERS ON SLOPING GROUND SURFACES. II. WEDGE-SHAPED SNOW COVER ON A PLANAR SLOPE. (Shamen sekisetsu no naibu ōryoku oyobi nensei ryūdō. II. Tairana shamen no ue no kusabigata no sekisetsu; Text in Japanese with English summary). Teion-kagaku (Low Temp. Sci.), Ser. A, 22:101-117 incl. tables, graphs, diagra., March 1964. 5 refs.

DLC, Orientalia Div.

Stress and flow-velocity components within the snow cover were calculated by combining 2 solutions presented in Part I (see SIP 22111). As before, the snow was assumed to be an incompressible Newtonian fluid of high viscosity in a state of plane strain, but, in this case, there is no steady flow. Stress and velocity components are introduced to apply to such a snow cover flowing down a slope. Every year a monsoon deposits a wedge-shaped snow cover on the back slope of a pass located near Mt. Tateyama

# CORREL BIBLIOGRAPHY

in Toyama Prefecture, Japan. The uppermost portion of the snow cover is nearly wedge-shaped with an angle of  $30^\circ$ . When the radius vector is less than 4 m, there is tensile stress between the snow and the ground. This stress is insufficient to separate the two since its maximum value is only about 25 gr-wt/cm<sup>2</sup>. (From author's summary)

SIP 22113

551.321.5:539.31

Yosida, Zyungo  
INTERNAL STRESS AND VISCOUS FLOW OF SNOW COVER ON SLOPING GROUND SURFACES. III. SNOW COVER ON SLOPES WITH CIRCULAR CURVATURE. (Shamen sekisetsu no naibu uryoku oyobi nensei ryudo. III. Marui shamen no sekisetsu; Text in Japanese with English summary). Teion-kagaku (Low Temp. Sci.), Ser. A, 22:119-127 incl. table, graphs, diagrs., March 1964. 2 refs.  
DLC, Orientalia Div.

The stress and velocity components of the snow covers are derived by the same methods and with the same assumptions used in Parts I and II (see SIP 22111 and 22112). Formulas are given for determining the force which the snow cover exerts upon a barrier at the foot of the slope. -- BLE

SIP 22114

551.578.46:53(52)

Yosida, Zyungo  
STUDIES ON THE HEAVY SNOW IN THE DISTRICTS OF THE SEA OF JAPAN, 1963. (Hokuriku gosetsu no sekishitsu chosa; Text in Japanese with English summary). Teion-kagaku (Low Temp. Sci.), Ser. A, 22:129-146 incl. illus., table, graphs, March 1964. 5 refs.  
DLC, Orientalia Div.

Layer structure, microscopic texture, vertical distribution of density, free water content, and hardness of the snow cover was investigated in the middle of Feb. at Nagatsuka, Toyama, Inotani, Fukui, and Ono. All data are tabulated and graphed. Hardness values were highest in the lower part of the compact snow, which increased the difficulties of mechanically removing the snow from the roads. Light brown layers, colored by fine sand which was wind-carried from the Mongolian Desert, were found. At each location, the water equivalent of the snow cover was calculated from the vertical distribution of density, and was found to be in agreement with the total amount of snowfall recorded at the meteorological stations. The precipitation date of each layer was determined from these data. (From author's summary)

SIP 22115

551.326.7:539.413/.414(52)

Tabata, Tadashi and Kazuo Fujino  
STUDIES ON [THE] MECHANICAL PROPERTIES OF SEA ICE. VII. MEASUREMENT OF FLEXURAL STRENGTH IN SITU. (Kaihyo no rikigakuteki seishitsu no kenkyu. VII. Genjo ni okeru mage kyodo no sokutei; Text in Japanese with English summary). Teion-kagaku (Low Temp. Sci.), Ser. A, 22:147-154 incl. illus., tables, graphs, March 1964. 4 refs.  
DLC, Orientalia Div.

The relation between flexural strength and the increasing rate of applied stress was studied. A U-shaped channel was cut in the ice sheet using an ice chain-saw and a hand saw. A cantilever ice beam with one end attached to the ice sheet was made with this channel. The width of the beam was 30-40 cm and the length was 2.5-3.0 m. The ice beam was bent vertically downwards and horizontally. The applied force was measured with an electric load cell and recorded with an oscillograph. Since the bending force increases linearly, the tensile stress within the beam also increases linearly between 2-40 kg/cm<sup>2</sup>/sec. It is assumed that the beam was deflected and broken like an elastic substance because of the greatly increasing rate of tensile stress. The vertical distribution of the chlorine content of the upper 15-cm layer of the ice sheet was measured. The temperature of the ice sheet was recorded with a series of thermocouples frozen into it at vertical intervals of a few centimeters. Equations for calculating flexural strength are given, and the results are tabulated. It is concluded that the increasing rate of applied stress is an important controlling factor of the flexural strength of in-situ sea ice. (From authors' summary)

SIP 22116

551.566:551.326.14

Suzuki, Yosio  
ON THE MEASUREMENTS OF THE WIND DRAG OF AN ICE [FLOE] SHEET. (Hyoban no ukeru kaze no chikara no sokutei; Text in Japanese with English summary). Teion-kagaku (Low Temp. Sci.), Ser. A, 22:155-170 incl. illus., tables, graphs, diagrs., March 1964. 4 refs.  
DLC, Orientalia Div.

Knowledge of the wind drag of an ice floe is very important in the study of ice drift. Two series of experiments were conducted to investigate the usefulness of a new method of measuring wind drag, which enables one to obtain not only the average force but also the time dependent characteristics of the force. The method used is described in which the motion of an ice disk indicates the drag force. An equation for calculating the motion is given which includes components for the mass of the disk, the position vector, forces exerted by the suspension wires, and horizontal forces exerted by air and water. The wind was measured with cup anemometers. The roughness parameter and the Karman constant are de-

# CRREL BIBLIOGRAPHY

rived from the logarithmic law of wind profile for the case of neutral stability. The usefulness of the method was established; however, a new series of measurements which assures more accuracy is now in progress. (From author's summary)

SIP 22117

551, 574, 42:629, 12

Ono, Nobuo  
STUDIES ON THE ICE ACCUMULATION ON SHIPS.  
II. ON THE CONDITIONS FOR THE FORMATION  
OF ICE AND THE RATE OF ICING. (Sentai chakuhyō  
ni kansuru kenkyū. II. Chakuhyō joken to chakuh-  
yōryō ni tsuite; Text in Japanese with English sum-  
mary). Teion-kagaku (Low Temp. Sci.), Ser. A, 22:  
171-181 incl. illus., tables, graphs, diagrs., map,  
March 1964. 8 refs.  
DLC, Orientalia Div.

Studies of ice accumulation on patrol boats were car-  
ried out during the winters of 1960-1963. The icing  
meter, which consisted of an icing rod and a brine  
jar, was installed upon the open deck of the test ship  
Chitose in 1962 and 1963. Navigation routes and  
icing periods are shown. Two icing meters were set  
alternately every 4 hrs during the icing period. The  
main cause of icing was the freezing of sea spray,  
some of which froze on the rod. The rest flowed  
down the surface of the ice into the jar. The total  
weight of the spray was calculated from the sum of  
the weights of ice on the rod and brine in the jar.  
The weight and chlorine content of the ice and brine  
were measured for each sample obtained. The weight  
of ice deposited per hour, the ratio of the weight of  
the ice to spray, and the icing pattern on the rod are  
shown with respect to the mean air temperature and  
the mean relative wind velocity. This figure sug-  
gests that an increase in wind velocity increases the  
weight of ice and decreases the ratio of ice to spray.  
The ratio of ice to spray increases with falling tem-  
perature. The mode of pure and salt icing on the  
icing meter is schematically illustrated. Equations  
are given which show that the weight of brine in the  
ice is nearly equal to the weight of pure ice, and that  
the surface temperature of ice (-2° to -4°C) is equal  
to the freezing temperature of saturated brine.  
(From author's summary)

SIP 22118

91(091)(73):(\*7)

Shimizu, Hiromu  
GLACIOLOGICAL STUDIES IN WEST ANTARCTICA.  
I. OUTLINE OF U.S. ANTARCTIC RESEARCH  
ACTIVITY. (Seibu nankyoku tairiku ni okeru  
seppiyōgakuteki kenkyū. I. Amerika gasshūkoku  
nankyoku kansoku ni kansuru gaisetsu; Text in Japa-  
nese). Teion-kagaku (Low Temp. Sci.), Ser. A,  
22:183-210 incl. illus., tables, graph, diagr., maps,  
March 1964. 2 refs.  
DLC, Orientalia Div.

This paper presents a brief history of the U. S. Ant-  
arctic Research activities from 1790 to the present.  
It includes discussion of the administrative organiza-  
tion, research stations, transportation, and scien-  
tific research. Emphasis is focussed on logistics and  
scientific preparations for traverses in general, the  
Ellsworth Highland Traverse (1960-1961), the Ant-  
arctic Peninsula Traverse (1961-1962), and living  
conditions and scientific activity at Byrd, Hallett,  
McMurdo, and Wilkes Stations during Operation Deep  
Freeze in 1961. -- CBT/BLE

SIP 22119

521, 931, 1:551, 583, 7

Ewing, Maurice and William L. Donn  
POLAR WANDERING AND CLIMATE. In: Arthur C.  
Munyan (ed.), Polar Wandering and Continental  
Drift. Tulsa, Soc. Econ. Paleontologists & Min-  
eralogists, Spec. Publ. No. 10:94-99 incl. map,  
July 1963. 16 refs.  
DLC, Unbound periodical

Abundant evidence from many fields indicates very  
strongly that the Arctic Ocean was ice-free during  
the Wisconsin glacial stage, and it is postulated that  
the ice-free condition of the ocean is directly re-  
sponsible for the glacial stage. It is shown that the  
oscillations between ice-free and ice-covered states  
of the Arctic Ocean which could occur, would account  
for the alternations of Pleistocene climate. Although  
the Pleistocene climate oscillations of the Northern  
Hemisphere produced simultaneous oscillations in  
the Southern Hemisphere, it is concluded that the  
Antarctic ice cap persisted without major change  
through the Pleistocene. The transition from the  
climate of the early Tertiary to that of the Pleisto-  
cene, as typified by the cooling of western North  
America which began in the Oligocene Epoch, is  
attributed to a shift of the geographic poles from  
oceanic positions to their present thermally isolated  
positions. This shift is discussed in the light of  
paleomagnetic and paleobiological data. (Authors'  
abstract)

SIP 22120

551, 324, 82

Nutt, David C.  
SIGNIFICANCE AND TECHNIQUES IN THE STUDY  
OF GAS INCLUSIONS IN GLACIERS [sic] ICE.  
Polarforschung, 5(1/2):82-87, 1961, publ. June  
1963. 26 refs.  
DLC, G600.P6

Gas inclusions may originate from the atmosphere,  
trapped between snowflakes, compressed and sealed  
off as the snow changes to ice, or they may be frozen  
out of air equilibrated water. Chemical composition  
analysis of the gas can reveal the conditions under  
which the ice was formed or to what degree each  
process was involved. Gas may be extracted by  
shaving a cylindrical piece of ice or melting ice

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under vacuum and removing the gas with a mercury extractor. When larger inclusions occur, it is possible to remove the gas from individual bubbles with a mercury-filled microsyringe. The gas pressure can be determined by (1) the traditional specific gravity-volume technique which gives an average value for all inclusions within a block of ice, or (2) placing cold ice in a pressure chamber filled with a cold glycerine solution which causes a progressive surface melting while the ice remains cold. Methods are discussed of radio carbon dating of glacier ice from the CO<sub>2</sub> within the gas inclusions, and possible sources of error are given. Related investigations made as a part of the 1958 expedition to Greenland are also discussed. -- BLE

SIP 22121 551.324.3(\*526)

Wölcken, Kurt  
SEISMIC ICE-THICKNESS MEASUREMENTS ON NOVAYA ZEMLYA 1932-33. (Seismische Eisdickenmessungen auf Nowaja Semlja 1932/33; Text in German with English summary). Polarforschung, 5 (1/2):87-91 incl. diag., table, 1961, publ. June 1963. 3 refs.  
DLC, G600, P6

The results of seismic investigations indicate that the surface of the inland ice of Novaya Zemlya has no "mathematical" form and that crevices occur in the central part. The fact that the ice surface is agitated over-all suggests that there is no less relief beneath the ice than that of the visible coastal mountains. The longitudinal axis of the ice is clearly marked, although some cross-valleys are distinctly visible. It is probable that, were the ice nonexistent, the cross-valleys would join the Kara Sea with the Barents Sea as is the case with the Straits of Matochkin Shar. Ice thickness measurements revealed that at 15 km from the coast, the ground beneath the ice is actually below sea level. In the Tehajev glacier (in which the temperature is -11°C), the velocity of the longitudinal waves is 3800 m/s. The velocity of the transverse waves is 1760-1770 m/s. (Author's abstract, modified)

SIP 22122 551.324.6(\*384)

Weidick, Anker  
DIFFERENTIAL BEHAVIOUR OF THE ICE CAP MARGIN IN THE JULIANEHÅB DISTRICT, WEST GREENLAND. Polarforschung, 5(1/2):91-94 incl. graph, 1961, publ. June 1963.  
DLC, G600, P6

A chronology was established for the ice margin deposits in the district, based on the assumption that the uppermost marine level in Julianehåb is older than boreal time and that 50% of the land upheaval occurred in or before boreal time. Maps made in

the summers of 1957, 1958, and 1960 of several moraines, kame terraces, and alluvial plains indicate several halts in the recession of the ice in holocene time. Three stages [Niaqornakasik stage (oldest), Tunugdliarfik stage, and Narssarssuaq stage (youngest)] in the sense of Bruckner and Penck are established, and where these stages represent local glaciations, an estimate of the former glaciation limit permits an extrapolation of the former summer climate. "The little ice age" follows these stages. The volume alterations of the ice cover are also discussed. -- BLE

SIP 22123 551.33(\*36)

Davies, William E.  
GLACIAL GEOLOGY OF NORTHERN GREENLAND. Polarforschung, 5(1/2):94-103 incl. illus., tables, maps, 1961, publ. June 1963.  
DLC, G600, P6

Four distinct phases of the latest glaciation have been recognized as a result of studies made from 1956 through 1960. The last glaciation extended over most of the land and removed traces of previous ones. Retreat of the ice mass began some time prior to 6000 yr ago. This was followed by a rise in sea level which deposited clay-silt succeeded by kame gravels around stagnant ice lobes in the large valleys. Marine terraces, up to 129 m above present sea level, developed as readjustment occurred in the land free of ice. About 3700 yr ago an advance of glaciers down major fjords took place and was followed by retreat to approximately the present position of the ice. The till in Peary Land, north of Frederick E. Hyde Fjord, contains only locally-derived materials which indicate that the central Greenland ice cap did not cover the area. (Author's abstract, modified)

SIP 22124 551.594.5(\*7)

Schneider, Otto  
THE POLAR LIGHT ZONE OF THE SOUTHERN HEMISPHERE. (Die Polarlichtzone der Südhalbkugel; Text in German with German and English abstracts). Polarforschung, 5(1/2):103-110 incl. graphs, maps, 1961, publ. June 1963. 25 refs.  
DLC, G600, P6

This article discusses the difficulties of determining the position of the polar light zone, possible definitions, temporal changeability, dissimilarities of observations, and the shape of the zone. An isochasm map (1945) is given which shows the frequency of occurrence of the polar light on dark, clear nights, theoretical derivations of the zone are discussed, and results obtained by Japan, England, and Argentina are given. It is pointed out that the zone has been fixed for only half of its circumference, and a



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table of the coordinates of the Antarctic stations mentioned in the text is given. (Author's abstract, modified)

SIP 22125

536.24:551.323

Tien, Chi and Yin-Chao Yen  
AN ADDITIONAL NOTE ON THE MODIFIED  
LEVEQUE PROBLEM. J. Geophys. Res. 69(5):  
1672-1673, April 15, 1964. 1 ref.  
DLC, QC811.J6

In an earlier paper (SIP 21848) the problem of laminar heat transfer over a melting plate was studied under the assumption that the flow near the interface could be considered as  $v_x = cy$ , where  $v_x$  is the velocity along the plate,  $y$  is a coordinate normal to plate and  $c$  is a constant in velocity distribution. The assumption simplified the subsequent analysis but there is doubt as to the validity of the simplification. This note investigates the same problem without this arbitrary assumption. In this investigation  $c$  is considered to be a function of the longitudinal distance. It is concluded that the results obtained earlier on a restricted assumption are applicable to more realistic cases. -- BLE

SIP 22126

551.326.7:537(\*3)

Wentworth, F. L. and M. Cohn  
ELECTRICAL PROPERTIES OF SEA ICE AT 0.1 TO  
30 Mc/s. Radio Sci. 68D(6):681-693 incl. illus.,  
graphs, June 1964. 17 refs.  
DLC, GPRR

An experimental program is described in which the resistivity and dielectric constant of Arctic sea ice were measured. Fourteen ice samples ranging in salinity from 0.067 % to 23 % by weight were studied. The ice samples (obtained in the vicinity of ice islands T-3 and ARLIS II in 1962) were cut with a SIPRE 3-in. coring auger from ice 1 month to 3 yr old. The samples were individually packaged in plastic bags and stored at -20°C. The measurement technique and the specimen holder (a capacitor in which the specimen is the dielectric between the plates) are described. Specimens were prepared in the form of discs 1/8 in. thick. The values of dielectric constant and the computed values of loss tangent are given as a function of frequency for temperatures from -5°C to -40°C. The relationship of dielectric constant and conductivity at 3 Mc/s is also given as a function of salinity at -10°C, -20°C, and -30°C. Results verify the fact that the salinity of sea ice has a diminishing effect on the electrical properties with increasing frequency. -- BLE

SIP 22127

551.345:536(\*440)

Jacobsen, G.  
DEEP PERMAFROST MEASUREMENT IN NORTH  
AMERICA. Polar Record, 11(74):595-596, May  
1963.  
DLC, G875.P6

During the fall and winter of 1961-1962, a dry oil well, drilled to 12,540 ft at Winter Harbour, Melville Island, N.W.T., was (1) cased with 9-5/8" casing, (2) plugged with a 150-ft cement plug at 2000 ft, (3) filled with diesel oil, and (4) furnished with a thermistor to measure the depth of permafrost and the temperature gradient. Temperatures are not expected to reach their pre-drilling values for several years, but preliminary measurements indicate that subfreezing temperatures extend to 1500 ft. A second hole is planned farther inland and at a greater elevation. Thermal conductivity measurements on the core will permit a determination of the flow rate of heat from the earth's interior. It is expected that analysis of temperatures in the two holes will yield information on recent climatic changes and post-glacial emergence in the northern Canadian Arctic. -- BLE

SIP 22128

621.43.036.001.4(211)

Gifford, S. E.  
POLAR CONSTRUCTION EQUIPMENT - UNIVERSAL  
ENGINE-STARTING KIT. Tech. Rept. R-311, U. S.  
Naval Civil Eng. Lab., 15p. incl. table, diagra.,  
May 25, 1964. 7 refs. (Task Y-F015-11-01-291)  
DLC, Tech. Rept. Collection

This report covers the development and testing of an engine-mounted kit to facilitate starting and operating liquid-cooled engines in low temperatures. The kit was designed to preheat the engine, oil, and battery, and to provide ignition assistance during cranking. The components included a gasoline-burning coolant heater, an electric coolant heater, an ether priming system, a battery heating system, and a crankcase shroud. Laboratory tests and field trials showed that the kit as a whole was adequate for low-temperature engine starting when using sub-zero oil for the engine lubricant. However, with a change to 20-weight oil in the mid-1950's, it was found that the kit heaters did not provide sufficient heat for engine starting in temperatures below 0°F. The ether priming system and the battery heating system were found to be useful starting and operating aids for liquid-cooled engines on polar transportation and construction equipment under all conditions. (Author's abstract)

# CRREL BIBLIOGRAPHY

SIP 22129

551.332.5(\*49)

Price, Robert J.  
LAND FORMS PRODUCED BY THE WASTAGE OF  
THE CASEMENT GLACIER, SOUTHEAST ALASKA.  
Institute of Polar Studies, Rept. No. 9, 24p. incl.  
illus., table, graph, diagrs., maps, Feb. 1964.  
12 refs.

DLC, Tech. Rept. Collection

An area of 15 mi<sup>2</sup> between the terminus of the Casement Glacier and the shore of Muir Inlet, in the Glacier Bay National Monument, was studied for 11 weeks during the summer of 1962 and revisited briefly in 1963. Information has been obtained about the nature of ice wastage and the processes involved in the development of eskers and meltwater channels. The Casement Glacier has retreated from Muir Inlet across a ridge of Hypsithermal gravels topped by Little Ice Age till. Since 1929 the ice front of the Casement Glacier has retreated down a "reverse-slope," i.e., the altitude at the base of the ice front has become progressively lower. Although the underlying topography was an obstacle to the free movement of meltwater from the glacier west to Muir Inlet, 3 major meltwater channels were established at an early stage and continued to function until an alternate route, south to Adams Inlet, was established. One large esker system was mapped in detail; gravel ridges 30 to 60 ft high form a complex system 1 mi and 1/2 mi wide. Most of the eskers developed in supraglacial or englacial streams. Since the Casement Glacier began to terminate on land in 1907, it has retreated a maximum of 4 mi to its 1963 position. The construction of maps from the 1946 and 1948 photographs enabled a detailed analysis of the morphological changes that have taken place near the ice margin between 1946 and 1963. Since 1946, glaciofluvial erosion, rather than glaciofluvial deposition, has been dominant. (Author's abstract, modified)

SIP 22130

551.331.52:551.465(\*423)

Nutt, David C.  
FJORDS AND MARINE BASINS OF LABRADOR.  
Polar Notes, No. 5:9-24 incl. table, maps, June 1963. 12 refs.

DLC, Unbound periodical

The coastal waters of Labrador are characterized by an excess of precipitation and run-off over evaporation and by seasonal extremes of climate and fresh-water discharge. During winter air temperatures as low as -30°C occur, and the waters are ice covered for 6 to 7 months. Summer air temperatures may rise above 30°C and the waters are ice free. The cold southward flowing Labrador Current is the only marine water source available for exchange in the coastal waters. In Hebron Fjord, isothermal and isohaline conditions exist in winter with temperatures of -1.7° to -1.8°C. Winter conditions in Nain

Bay are similar to those in Hebron Fjord but turbulence provides energy to break down the stratification of summer, and basin temperatures reach as high as 4°C. The Hamilton Inlet-Lake Melville Estuary is a series of sills and basins which extends 125 mi inland. Fresh-water discharge from major rivers maintains stratification throughout the year, and a warm-water wedge with positive temperatures remains in the inner basins during winter. In spite of varying oceanographic regimes in the basins, regular renewal of the basin water occurs in each instance. The regimes in the basins are controlled by the nature of the transition separating the basin from the marine source water, and the nature of the fresh-water inflow. (Author's abstract, modified)

SIP 22131

612/614:910.3(\*3)

Fisher, Frank R. (ed.)  
MAN LIVING IN THE ARCTIC. PROCEEDINGS OF  
A CONFERENCE, QUARTERMASTER RESEARCH  
AND ENGINEERING CENTER, NATICK, MASSA-  
CHUSETTS, 1, 2 DECEMBER 1960. Natl. Acad.  
Sci.-Natl. Res. Council, 143p. incl. illus., tables,  
graphs, maps, 1961. 67 refs.

DLC, QP82.C65

Seventeen papers are presented which were read at the Conference on Man Living in the Arctic. They are concerned with the significance of logistics and research and development in the Arctic, limitations to living in polar regions, acclimatization of man to cold, gateways to the Arctic, physiological principles for protection of man in the cold, health maintenance, psychiatric problems of man in the Arctic, utilization of the Arctic's natural resources, human society in the Arctic today, and the role of politics in the expanding utilization of the Arctic. The dedication of the Wilkins Arctic Test Chamber at the Army Quartermaster Corps is appended. -- BLE

SIP 22132

061.6:5:623(73)

Air Force Cambridge Research Laboratories.  
Office of Aerospace Research, Bedford, Mass.  
REPORT ON RESEARCH FOR THE PERIOD JULY  
1962-JULY 1963. AFRL-64-25, 260p. incl. illus.,  
tables, graphs, diagrs., map, appendixes A-C, Feb.  
1964. 464 refs.

DLC, Tech. Rept. Collection

This report summarizes the research activities of the Air Force Cambridge Research Laboratories (AFRL), and describes recent achievements, progress, and results obtained by AFRL scientists. Among the topics discussed are electromagnetic scattering from hailstones, air glow and the aurora, snow properties, geology, and seismology. The appendixes list the AFRL projects by program element, discuss the organization's history, and present organization charts. -- BLE

# CREL BIBLIOGRAPHY

SIP 22133

551.524.72:551.510.53(\*2)

Warnecke, G.  
TEMPERATURE PATTERN IN THE STRATOSPHERE  
OF BOTH POLAR REGIONS. (Über den Temperatur-  
verlauf in der Stratosphäre der beiden Polargebiete;  
Text in German). Polarforschung, 5(1/2):127-132  
incl. table, graphs, 1962, publ. Oct. 1963. 9 refs.  
DLC, G600.P6

Temperature patterns within the stratosphere are de-  
scribed and compared from data gathered at Arctic  
and Antarctic stations between 1950 and 1963. Radio-  
sonde measurements made over Little America be-  
fore the IGY revealed that the yearly temperature  
fluctuation is greater in the Antarctic than that in the  
Arctic. The differences are more pronounced in the  
summer when the stratospheric temperatures are  
much higher in the South Pole area than those in the  
North Pole area. Charts are given of temperature  
observations made over Alert Station in the Arctic  
and Amundsen-Scott Station in the Antarctic, and  
temperature increases are tabulated for the central  
part of the Arctic. -- BLE

SIP 22134

551.562:551.42/.43(\*746)

Skelb, Günter  
COMMENTS ABOUT THE OROGRAPHY AND  
WEATHER OF DRYGALSKI ISLAND. (Einige Be-  
merkungen über Orographie und Witterung der  
Drygalski-Insel; Text in German). Polarforschung,  
5(1/2):132-135 incl. tables, graph, diagr., 1962,  
publ. Oct. 1963. 5 refs.  
DLC, G600.P6

Observations were made on Drygalski Island from  
May to Aug., 1960. Observations carried out at the  
same time at Mirnyy, on the West Ice Shelf, and on  
an ice island off the edge of the Shackleton Ice Shelf,  
permitted interesting comparisons, and showed the  
influence which the catabatic winds on the coast of  
the continent and the cyclonic air over the ocean  
farther north have on the weather on the coast of the  
continent. The island, which consists mostly of ice  
and is situated in the Davis Sea, rests on a bank  
covered with moraine deposits; it is 204 km<sup>2</sup> (20.6  
km in length along the long axis and 13.4 km along the  
short axis) covered with ice which rises 327 m above  
sea level. The mass balance of the island is negative,  
and the weather is favorable during the summer  
months (Dec. and Jan.) and extremely bad during the  
winter. During the period of observation (73 days) at  
Mirnyy in 1960, 44 days were stormy (maximum  
wind speed > 15 m/sec) and 3 days had wind speeds  
> 30 m/sec. During the same period at Drygalski  
Island, 36 days were stormy, 5 days had wind speeds  
> 30 m/sec, and fog was observed on 34 days. Sun  
and lunar halos, Brocken specters, and intensive  
polar lights were also observed from Drygalski  
Island. -- BLE

SIP 22135

551.324.84:551.510.4

Georgii, Hans-Walter  
TRACE ELEMENT CONTENT OF GLACIER ICE.  
(Der Spurenstoffgehalt des Gletschereises; Text in  
German with English abstract). Polarforschung,  
5(1/2):140-144 incl. tables, graphs, 1962, publ.  
Oct. 1963. 8 refs.  
DLC, G600.P6

See SIP 20961.

SIP 22136

551.578.46:551.510.721(234.3-984)

Gazert, V., D. Pözl and R. Reiter  
QUANTITATIVE DETERMINATION OF NUCLEAR-  
FISSION PRODUCTS IN [SNOW] SAMPLES FROM  
THE NORTHERN LAPS AND SPITZBERGEN IN 1960.  
(Quantitative Bestimmung von Kernspaltprodukten in  
Proben aus dem Nordalpenraum und aus Spitzbergen  
im Jahre 1960; Text in German with English abstract).  
Polarforschung, 5(1/2):152-153, 1962, publ. Oct.  
1963.  
DLC, G600.P6

Tests were made of the top layer of snow because,  
upon melting of the snow, fission products (which  
combine with dust particles) remain in the upper  
layer. Since the ablation was unusually great (ca.  
150 cm within 5 weeks), it was also possible to deter-  
mine the precipitation pattern within the last few  
years. The samples were melted and filtered,  
whereby 99.9% of the fission products were obtained.  
The measurements indicate that the fallout is  
approximately equal in the 2 areas, and that the  
quantity of Cs 137 was significantly lower in the  
Spitzbergen samples than that in the cores from the  
Alps. -- BLE

SIP 22137

551.332.57:551.342(\*22)

Tidten, Günter  
UNUSUAL BOULDER MIGRATIONS UNDER SPECIAL  
CONDITIONS AT BJÖNAHAMN, EISFJORD, SPITZ-  
BERGEN. (Ungewöhnliche Steinblock-Migrationen  
unter besonderen Bedingungen bei Bjónahamn,  
Eisfjord, Spitzbergen; Text in German with English  
abstract). Polarforschung, 5(1/2):155-158 incl.  
illus., diagr., 1962, publ. Oct. 1963. Discussion.  
DLC, G600.P6

The mechanism of boulder migrations in a gravel  
field is explained, based on observations made dur-  
ing the summer of 1960, and the geology of the area  
is described. The only force capable of moving  
such large boulders is that of freezing. It is hypo-  
thesized that the movement mechanism consists of 2  
main periods with a total of 5 phases. The duration  
of a complete cycle is 1 year or longer. At the start

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of the process, the stones are on top of the gravel. In the fall, trough formations occur and at night the soil is frozen. During the day, the stone protects the ice which has formed beneath it from melting. The ice is made more or less plastic by the weight of the stone and the gravel is squeezed out gradually into heaps around the stone. When the gravel is removed down to the permafrost area, the wandering phase begins. The ice under the stone is increased by the meltwater which is prevented from draining by the gravel enclosure until the stone is higher than the surrounding mound of gravel. When warm air melts one side of the ice during the day, the stone rolls a distance down the slope. -- BLE

SIP 22138

551,463,08

Vasil'ev, N. F.  
ATTACHMENT TO A REMOTE-CONTROL ELECTRIC THERMOMETER MAKING POSSIBLE MEASUREMENT OF THE TEMPERATURE OF THE SURFACE LAYER OF WATER FROM A MOVING VESSEL. (Prisposoblenie k distantsionnomu elektrottermometru, pozvoliaushchee izmeriat' temperaturu poverkhnostnogo sloia vody na khodu sudna; Text in Russian). Meteorologiya i Gidrologiya, No. 3:51-53 incl. diags., 1964.

DLC, Slavic Div.

A simple attachment is described which permits precise measurement of the vertical distribution of water temperature from a moving vessel. The attachment can be used with any electric thermometer with an automatic recorder. The instrument is illustrated and described. Tests have shown that temperature in a 10-m layer can be measured in 12-13 sec. The length of the towing cable is 70-75 m. The depth of sounding can be increased to 30-50 m by decreasing the speed of the vessel or increasing the length of the cable or the size of the weight attached to the instrument. -- JPRS abstract

SIP 22139

551,501:551,578,46

Nakatao, Tetsuro  
DENSITY MEASUREMENT OF DRIFTED SNOW. (Sekisetsu mitsudo no sokutei; Text in Japanese with English abstract). Nogyo Doboku Kenkyu (J. Agr. Eng. Soc. Japan), 31(7):6-8 incl. diags., graphs, April 1964.  
DLC, Orientalia Div.

A new simple device for measuring the depth and density of drifted snow is discussed. An electrically heated body placed on the snow surface goes down into the snow by melting the drifted snow. Its sinking velocity is inversely proportional to the density of snow, i.e., the time required to go a given distance at any point is proportional to the density of the snow. The device gives instantaneous electrical contacts at the end of every distance; therefore, one can determine the depth of the drifted snow from the number

of electric contacts and the density from the time interval between succeeding contacts. Some practical details of the 2 devices, one of the simplest type and another for recording the density, are described. An example of such records and several types of density distribution are illustrated. (Author's abstract)

SIP 22140

551,515,9:551,465(268)

Shpal'ner, A. O. and V. N. MoreGki  
THE POLAR HYDROLOGICAL FRONT IN THE GREENLAND AND NORWEGIAN SEAS. (Polarnyi gidrologicheskiy front v grenlandskom i norvezhskom morakh; Text in Russian). Okeanologiya, 4(2):267-276 incl. tables, map, diagr., 1964. 11 refs.  
DLC, Slavic Div.

A thorough study of the position of the polar front in the Greenland and Norwegian Seas has been made using both Soviet and foreign data. The common features of the polar front in both seas are given, and the fronts of the Norwegian, Greenland and Arctic Seas are compared. It is shown that the parameters of the fronts for the Arctic Sea differ greatly with respect to criteria from the parameters for the Norwegian and Greenland Seas; therefore, the Arctic fronts should not be lumped together with the fronts in the Norwegian and Greenland Seas under the common name "polar front." The fronts of Arctic seas should be divided into 2 classes: the Arctic front, a discontinuity between warmed and freshened surface waters, and (2) a river-mouth hydrological front forming near the mouths of major rivers as a result of contact between warmed and freshened waters and the water masses of the sea. -- JPRS abstract

SIP 22141

550,312:(\*746)

Avsiuk, N. N. and N. D. Bulanzhe  
INITIAL GRAVIMETRIC STATIONS IN ANTARCTICA. (Iskhodnye gravimetricheskie punkty v Antarktide; Text in Russian). Geofizicheskiy Bül., No. 13:41-42 incl. table, 1963.  
DLC, QC801.3.M4

The initial gravimetric station for Soviet work in Antarctica is Mirnyy; the initial point is situated in the cosmic ray observatory on a concrete slab; the coordinates are  $\phi = 66^{\circ}33'.23$ ;  $\lambda = 93^{\circ}00'.9E$ ;  $H = 20.7$  m. In 1958 Sparkman obtained for this point  $g = 982.407.4 \pm 2.0$  mgal (in the Potsdam system, using a LaCoste gravimeter). SN-3 gravimeters have been used to determine the gravity difference between Mirnyy and interior stations. The results of these determinations, reduced to Mirnyy, are tabulated. Measurements are made on snow runways at these stations, so that corrections must be introduced to account for snow accumulation and loss. The Aerogravimetric Laboratory of the Institute of Earth Physics has compiled a composite catalog of gravimetric stations determined in Antarctica up to Jan. 1, 1962. -- JPRS abstract

# CRREL BIBLIOGRAPHY

SIP 22142

551.324.3:(\*7)

Kapitsa, A. P.  
ICE COVER THICKNESS IN THE CENTRAL REGIONS OF EAST ANTARCTICA. (Moshchnost' lednikovogo pokrova (Central'nykh raionov Vostochnoi Antarktidy; Text in Russian). Geofizicheskii Bulletin, No. 13:57-64 incl. tables, diagrs., 1963. 7 refs.  
DLC, QC801.3.M4

The thickness of the Antarctic ice sheet was measured along a traverse from Komsomol'skaya to Vostok to the South Pole in 1959. Three to ten seismic shots were set off in holes 35 to 54 m deep at each station. The charges varied in weight from 2.5 to 10 kg. The error in shot time determination did not exceed 2 microseconds. O. G. Sorokhtin proposed a method which was applied successfully to eliminate serious background interference. Processing of seismograms is discussed; several oscillograms are included and are described and interpreted. Station elevations and ice-sheet thicknesses, based on seismic and gravimetric data, are tabulated. Two diagrams show the surface and subsurface profiles along the traverse routes. The data suggest the existence of a water layer beneath the ice sheet; water salinity studies near the postulated points of emergence of this water into the ocean may confirm this supposition. -- JPRS abstract

SIP 22143

551.584:551.506.22(\*701)

Dalrymple, Paul C.  
SOUTH POLE MICROMETEOROLOGY PROGRAM. PART I: DATA PRESENTATION. Tech. Rept. ES-2, Earth Sci. Div., U. S. Quartermaster Res. and Eng. Center, Natick, Mass., 388p. incl. illus., tables, diagrs., Oct. 1961.  
DLC, Tech. Rept. Collection

This report presents hourly and daily data from the temperature and wind profile studies that were conducted at Amundsen-Scott Station during the IGY. A brief text describes the station and its general climatology, the program and instrumentation, the data-reduction system, and the presentation of data. Temperature profiles were measured on 279 days between Feb. 3 and Nov. 22, 1958. Temperatures were measured with very fine gauge copper-constantan thermocouples at 7 depths (-800, -250, -50, -25, -10, -5, and -2 cm), surface, and 9 heights (3, 6, 12, 25, 50, 100, 200, 400, and 800 cm). Wind profiles were measured with small plastic 3-cup anemometers at the same heights as the top 6 thermocouples (25 to 800 cm). The presentation of temperature profile data includes hourly and daily mean temperatures (°C) for 5 depths (-250 and -800 cm are excluded), surface, and all heights. The temperature-measuring system recorded 18.7 cycles during a complete hour. Tables of temperature profile data indicate the number of observations used to compute hourly and daily mean temperatures for each level. Tables of wind profile data show the wind speed in

centimeters per second at all 6 levels. Part II, Data Analysis, follows as SIP 22144. (Author's abstract, modified)

SIP 22144

551.584:551.506.22(\*701)

Dalrymple, Paul C., Heins H. Lettau and Sarah H. Wollaston  
SOUTH POLE MICROMETEOROLOGY PROGRAM. PART II: DATA ANALYSIS. Tech. Rept. ES-7, Earth Sci. Div., U. S. Quartermaster Res. and Eng. Center, Natick, Mass., 94p. incl. tables, graphs, diagrs., June 1963. 23 refs.  
DLC, Tech. Rept. Collection

This report deals with the analysis of data presented in Part I (SIP 22143) and is directed toward determining the energy exchanges at the snow-air interface. Moderate to extreme stability is representative of average conditions, resulting in a significant tendency to suppress mechanical turbulence. The maximum inversion was 14.7°C in the lowest 8 m. Stability was greatest in the early winter and at periods with lowest temperatures. The wind profile curvature decreases as stability increases. However, with great bulk stability, the wind profile Deacon number as a function of height reaches a minimum near 0.25 and then increases upward, in spite of height-increasing Richardson number. The relation between winds near the snow surface and at the top of the inversion (on the average near 600 m above ground) was analyzed. This analysis demonstrates that air motion in the lower atmosphere is controlled by surface friction, and by the wind in the free atmosphere modified by thermal winds due to horizontal temperature gradients resulting from the general slope of the terrain. Heat movement in the substratum was investigated by harmonic (Fourier) analysis of snow temperature variations. It was found that the upper 4 m of snow respond to other influences (radiation absorption, packing, etc.) in addition to genuine heat conduction. As part of the surface energy budget studies, the latent heat flux indicates slight but significant deposition of hoarfrost in midwinter. (Authors' abstract, modified)

SIP 22145

528.7:551.324.3:(\*772)

Brandenberger, A. J.  
AERIAL TRIANGULATION IN THE ANTARCTIC. Photogrammetric Eng. 30(2):197-201 incl. illus., diagrs., map, March 1964. 11 refs.  
DLC, TA563.A2P5

Field work for an aerial triangulation study between Byrd Station and the Whitemore Mountains started in the austral summer 1962-63. This paper describes the scientific, technical, and organizational aspects of the program as well as the photogrammetric operations conducted in the Antarctic. The scope of

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the program is to determine the ice flow between Byrd Station and the Whitmore Mountains by means of a periodical aerial triangulation repeated annually for 5 years. For this purpose approximately 140 permanent markers were placed between Byrd Station and Mt. Chapman covering a strip area of about 375 km by 8 km. Black-top markers were designed to be identifiable on the aerial photography. Directly after the field work was completed four vertical photography strips were flown over the marker area with an overlap of 60 and 80% from 6000 and 3000 m above ice. A first examination of the photography by means of a stereoscope has shown that markers are identifiable. -- JFS

SIP 22146

551.334.2

Evteev, S. A. and G. I. Lazukov  
THE IMPORTANCE OF GLACIOISOSTASY IN MOVEMENTS OF THE EARTH'S CRUST IN REGIONS OF GLACIATION. (O znachenii glatsioizostazii v kvizheniakh zemnoi kory oblastei oledeneniia; Text in Russian). Doklady Akad. Nauk SSSR, 155(2):337-339, 1964. 11 refs.  
DLC, Slavic Div.

It is presently assumed that the additional loads caused by the formation of large masses of ice in regions of glaciation exert a substantial influence on the character of vertical movements. It is assumed that glacioisostasy is the principal and only cause of oscillating movements of the earth's crust in regions with thick glaciers. Tectonic movements in these regions are assigned an insignificant role. The basic proof advanced in support of glacioisostasy is the existence of negative gravity anomalies in regions of Pleistocene glaciation (Fennoscandia) and the absence of anomalies in areas of recent glaciation (Antarctica). However, gravity data accumulated to the present time indicate that gravity anomalies similar to, and greater than, those in Fennoscandia exist on all platforms; the values and signs of the anomalies often do not correspond to the scale and direction of tectonic movements. Analysis of available data on gravity anomalies of regions of recent and ancient glaciation, and Quaternary tectonic movements of regions with and without glaciers indicate that the glacioisostatic factor has exerted no appreciable influence on the character of vertical movements and their development with time. Tectonic movements are the responsible factor; glacioisostasy may play some role, but its exact importance cannot be evaluated. -- JPRS abstract

SIP 22147

551.312.2:(\*784.2)

Rüe, E. Aubert de la  
SOME CHARACTERISTICS OF THE PEAT BOGS OF KERGUELEN ARCHIPELAGO. THEIR DISTRIBUTION, THEIR STRUCTURE AND THEIR DESTRUCTION. (Quelques particularités des tourbières de l'archipel de Kerguelen. Leur répartition, leur structure et leur destruction; Text in French). TAAF, No. 21:12-30 incl. illus., Oct.-Dec. 1962. 4 refs.  
DLC, G845.F7

Peat bogs occupy approximately 50,000 hectares of Kerguelen Islands, confined to the littoral zones and main valley floors, at altitudes of 200 to 250 m. They are usually accumulations of successive generations of *Azorella* or tussock (*Poa cookii*), among other species. Their homogeneity is variable and irregular, some containing intercalations of lenticular bodies of foreign material, others horizontal and concordant with the general stratigraphy. The bedrock is chiefly basalt, tuffs, conglomerates, and glacial moraines. Erosion, freeze-thaw cycles, and the animal population are the main factors destructive to peat bogs, the most disastrous being the rabbits. The text is supplemented with photographs and two stratigraphic cross sections. -- GAD

SIP 22148

625.89:551.326:(\*764)

Moser, Earl H., Jr.  
SNOW COMPACTION IN ANTARCTICA - ROADS ON SNOW-COVERED SEA ICE. Tech. Rept. R-298, Type C, Final Rept., U. S. Naval Civil Eng. Lab., 23p. incl. illus., graphs, diagrs., map, March 16, 1964. 8 refs. (Proj. Y-F015-11-01-053)  
DLC, Tech. Rept. Collection

An experimental 22-ft-wide road was constructed between McMurdo Station and Williams Field in Oct. and Nov. 1960. This road included 3 mi of snow road, 1.4 mi of ice road, a snow-wedge transition ramp between the ice road and the shore at McMurdo Station. During construction the snow road was depressed about 10 in. below the natural surface of the snow. This accelerated the accumulation of drift, which was windrowed to the edges of the road following each storm. Eventually, berms 2 ft high were built up along each side of the road. As a result, in mid-Dec. a 3-day blizzard filled the roadway with snow and it was abandoned. The road was used day and night for a 10-day period during late Nov. and early Dec. by all types of wheeled vehicles including 30-ton tractor-and-trailer rigs. It was concluded that a network of snow roads between McMurdo Station and its outlying facilities will improve the ground communications and transportation threefold between these points. However, continued development is required to improve the construction and maintenance techniques for such roads. (Author's abstract, modified)

# CRREL BIBLIOGRAPHY

SIP 22149

656, 61, 052:551, 328(+62)

Stead, Gordon W.  
CURRENT CANADIAN COAST GUARD OPERATIONS  
IN ICE. Polar Record, 12(77):147-155 incl. illus.,  
map, May 1964.  
DLC, G575.P6

Maritime traffic in ice-congested waters in Canada is described with emphasis on the organization of the Canadian Coast Guard, arctic conditions in the navigation season, the pattern of summer operations, year-to-year differences in ice conditions and movements, and winter operations in the Gulf of St. Lawrence. The areas in which Arctic navigation is feasible are exposed to wide seasonal and year-to-year fluctuations in temperature and wind patterns. The intricate configuration of the Canadian Arctic archipelago also plays an important part by limiting ice movement. Ice conditions were most difficult during the summer of 1963. This season is compared with its predecessors. In the Gulf of St. Lawrence, ice is formed locally and only a small percentage flows out of the river. There is a strong tendency for ice to raft upon lee shores and in the shallows in the southern portion of the gulf. It struggles for access to the sea and tends to concentrate in Cabot Strait between Breton and Newfoundland. Once through this bottleneck, inbound commercial shipping can often be routed under the lee of Anticosti Island or the North Shore, depending on the winds. As in the Arctic summer, and for similar reasons, winter ice conditions in the Gulf of St. Lawrence vary considerably from year to year, but in these latitudes commercial traffic is interrupted only for short periods in the hardest seasons. -- BLE

SIP 22150

551, 321:539, 155, 2(+2)

Lorius, C.  
ISOTOPES IN RELATION TO POLAR GLACIOLOGY.  
Polar Record, 12(77):211-222 incl. graphs, diagrs.,  
May 1964. 24 refs.  
DLC, G575.P6

Radioactivity occurs in 2 forms, natural and artificial. Natural radioactivity is mainly due to radon and thoron (and to their decay products such as Pb 210) which come primarily from uranium and thorium enclosed in rocks. Artificial radioactivity is due to fission products of U 235 and Pu 239 and to radioactive products from thermonuclear reactions (especially Tr). In glaciology, radioactive isotopes are used primarily for dating. Absolute age determinations are based on the decay of activity following the formula:  $P_t = P_0 e^{-\lambda t}$ , where  $P_0$  is the number of the original radioactive atoms at the start,  $P_t$  is the number at time  $t$ ,  $\lambda$ , the radioactive constant, is related to the half life (T) of the element by  $\lambda = 0.693/T$ . The basic hypothesis for all these determinations is that the rate of decay is known and constant. Carbon 14 has not yet been found in organic

form in polar ice; therefore, it has to be obtained from CO<sub>2</sub> contained in the air bubbles enclosed in the ice. Stable isotopes used in glaciology are deuterium (D) and oxygen 18. Due to the fact that there is a seasonal variation in the stable isotope content of snow, it is possible to count the years by analyzing samples from superimposed layers. Another application of isotopes to glaciology is to determine the origins and velocities of icebergs. The various researches conducted in isotope glaciology are diagrammed. -- BLE

SIP 22151

551, 588:621, 317(52)

Kurobe, Teiichi and Choju Fukuda  
COMMUNICATION WIRE NOISE AT SNOWFALL.  
(Kosetsuji ni okeru taushin senro zatsuron ni tsuite;  
Text in Japanese with English abstract). Hokkaido  
Daigaku Kogakubu Kenkyu Hokoku (Bulletin of the  
Faculty of Engineering, Hokkaido Univ.), No. 33:1-  
13 incl. tables, graphs, diagrs., Nov. 1963. 1 ref.  
DLC, Orientalia Div.

The noise in communication lines experienced during a heavy snowfall or a snowstorm in winter consists of corona noise generated by the atmospheric electrical field and the discharge noise of a self-restoring lightning tube resulting from a potential rise in the line. Experiments at Hokkaido University verified the close relationship between corona noise and line currents. Comparisons made of current flow in bare wire, PVC [polyvinyl chloride] wire, rubber-covered wire and RD [rural distribution] wire showed that the RD wire has the smallest current flow. The relation of wire current and the weather was established from weather data and actual experiences. The cause of lightning tube noise by the rise in line potential was further studied, showing that line potential is proportional to line current. Various characteristics of the noise are described and methods of noise prevention are given. (From authors' summary)

SIP 22152

625, 532:697, 1(+2)

Hoffman, C. R.  
MODIFIED T-5 BARRACKS -- CONTROLLED CLIMATIC HEATING STUDIES. Tech. Rept. R-286,  
U. S. Naval Civil Eng. Lab., 55p. incl. illus.,  
tables, graphs, diagrs., appendixes A-C, May 12,  
1964. 5 refs. (Task Y-F015-11-01-149)  
DLC, Tech. Rept. Collection

This report presents the results of controlled climatic heating studies conducted on the Modified T-5 Barracks developed for polar use. The studies encompassed three areas of investigation: (1) heat-loss and heat-transfer analyses of the structural shell using electric heat sources and forced convection, and a thermodynamic evaluation of 2 different ceiling materials; (2) evaluation of the radiant hot-air floor plenum heating system designed by the Army Engineer Research and Development Laboratories;

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and (3) evaluation of the overhead duct hot-air heating, ventilation, and humidification system for use in the temporary polar camp developed by the Naval Civil Engineering Laboratory. The heat loss from the 28 x 56-ft building is 96,500 Btuh at 0° F, indicating an overall heat loss from conduction and infiltration of 0.158 Btuh/sq ft/° F. At these temperatures, a 1-in. acoustical fiberglass drop ceiling reduced the heat loss to 71,000 and 45,500 Btuh, or 26% and 19.5%, respectively. The floor plenum system produced very low levels of air stratification and excellent heat distribution in an unpartitioned building; however, the design does not permit regulation of air temperatures in partitioned rooms. Because of this and other shortcomings, the system is not recommended for use. (Author's abstract, modified)

SIP 22153

551.322:541.182:541.124  
539.124.14:551.322:546.33

Bennett, J. E., B. Mile and A. Thomas  
ELFCTRON SPIN RESONANCE SPECTRA OF  
HYDRATED ELECTRONS PREPARED BY REACTION  
OF ATOMIC SODIUM WITH ICE AT 77° K. *Nature*,  
261(4922):919-920 incl. table, Feb. 29, 1964. 7  
refs.

DLC, Q1.N2

Trapped electrons were prepared by the reaction of alkali metals with ice at 77° K in a rotating cryostat. A thin discontinuous layer of alkali metal atoms was deposited on a moving surface of a second reactant (in this case ice) held at 77° K and under high vacuum. A fresh layer of the second reactant was then deposited on top of the reaction products which thus became embedded in a rigid matrix. The process was repeated many times to build up a reasonable amount of material. The products of the reaction of sodium and potassium atoms with water or deuterium oxide at 77° K were also examined. The product was deep blue in all the experiments and the electron spin resonance spectrum consisted of a single narrow line. The spectrum indicated that the paramagnetic species could not be alkali metal atoms, hydroxyl radicals, or hydrogen atoms. It is concluded that (1) the cation does not influence the width or g-value of the resonance line, which shows that there is negligible interaction between the electron and the alkali metal nucleus; (2) there are approximately equal interactions between the electron and 4 protons; and (3) the electron is located in a well-defined trap and is associated with not more than 4 water molecules.  
-- BLE

SIP 22154

551.322:548.5

Latham, J.  
SYMPOSIUM ON ICE CRYSTALS AND ICE NUCLEATION, BERKELEY, CALIFORNIA, AUGUST 1963.  
*Brit. J. Appl. Phys.* 14(12):825-826, Dec. 1963.  
DLC, QC1.I548

Experiments have shown that ice can adhere to ice at temperatures down to -30° C and that plate-like ice crystals have greater adhesive powers than columnar ones. The contention that these observations provide evidence in favor of the "liquid film" hypothesis (which proposes that the surface layer of ice is distorted and exhibits many of the characteristics of a liquid film) appears disputable. It has also been shown that "spongy ice" is formed at ambient temperatures below -4.5° C and can contain up to 85% liquid water trapped in a mesh of interlocking ice dendrites. The growth of spongy ice may have an inhibitory effect on the Workman-Reynolds mechanism of thunderstorm electrification. A rival theory is described which is based on charge transfer associated with temperature gradients in ice. The conclusion drawn from the symposium is that although much information on the properties of ice has recently been acquired, the important problems remain unsolved. (Author's abstract, modified)

SIP 22155

551.578.71

Macklin, W. C.  
HEAT TRANSFER FROM HAILSTONES. *Quart. J. Roy. Meteorological Soc.* 89(381):360-369 incl. illus., graphs, July 1963. 27 refs.  
DLC, QC851.R8

The dependence of the rate of heat transfer on shape was determined by measuring the rate of melting of spheres and oblate spheroids of ice in an airstream. Three airstreams were employed: 13.6, 8.1 and 4.8 m/sec. The temperature and humidity of the airstream were determined before and after each experiment using wet- and dry-bulb thermometers held near the tunnel mouth. The dry-bulb temperatures ranged between 21° and 35° C, and the water-vapor densities between 7.9 and 15.7 g/m<sup>3</sup>. The objects were made by freezing distilled water in perspex moulds. The water was first de-aerated to prevent bubbles from forming near the surface and giving rise to irregularities during melting. Prior to each experiment, the appropriate object was placed in a melting-ice bath for a time sufficient to allow it to attain a temperature of 0° C. The objects were made in two sizes (major axes 5.1 and 3.8 cm respectively) and four shapes, and were exposed to the airstream from 1 to 2 min, depending on the airstream. Applying the results to hailstones it was found that, in terms of maximum dimensions of the stones, melting (1) increases as the ratio of the minor to major axes decreases, and (2) causes the stones to become more oblate. The critical liquid-water concentrations of spheroidal hailstones were deduced from the experimental data. These concentrations, for stones of the same maximum dimension, are dependent on the axis ratio. It is also shown that the up-draught profiles required to grow spheroidal hailstones at the just-wet condition vary little from those required for spherical stones. -- CLC



# CRRLE BIBLIOGRAPHY

SIP 22156

551.594.25  
551.322:536.421.4:537.529

Evans, D. G. and W. C. A. Hutchinson  
THE ELECTRIFICATION OF FREEZING WATER DROPLETS AND OF COLLIDING ICE PARTICLES. Quart. J. Roy. Meteorological Soc. 89(381):370-375, July 1963. 7 refs.  
DLC, QC851.R8

Studies have been made of the freezing of supercooled droplets which throw out ice splinters in the process. The cold chamber used for these studies was 10 cm deep, had a cross-section 30 cm square, and was surrounded with thermal insulation with suitable windows for illumination and observation with a telescope. For supporting water droplets, a tiny pyramid of Duroilx was attached by its apex to the lower end of the fibre so that the droplet clung to the pyramid base. Provision was also made for growing ice crystals from the vapor and then bringing them in contact with each other. The procedure of Mason and Maybank (SIP 19627) was used but with the Faraday cylinder and vibrating-reed electrometer for measuring charges. The freezing of 400 drops was investigated. For all but one of the 44 cases in which the drop broke, and where part had been ejected, there was a measurable charge on the residue. When supercooled drops 1.3 mm in diam. were nucleated at  $-0.2^{\circ}\text{C}$  and frozen and fragmented at  $-15^{\circ}\text{C}$ , the charges were comparable with those found in similar measurements by Mason and Maybank but were usually far too large to be accounted for by the Latham-Mason temperature gradient theory. When ice crystals differing in temperature by up to  $10^{\circ}\text{C}$  were brought into momentary contact, the charges produced were less than  $10^{-4}$  e.s.u. -- BLE

SIP 22157

551.594.252:536.421  
551.322:551.578.4:537.52

Matthews, J. B. and B. J. Mason  
ELECTRIFICATION ACCOMPANYING MELTING OF ICE AND SNOW. Quart. J. Roy. Meteorological Soc. 89(381):376-380 incl. diagrs., July 1963. 6 refs.  
DLC, QC851.R8

Attempts to measure the electrification produced by the melting of ice and snow, known as the Dinger-Gunn effect, have been made with 3 different experimental arrangements. In one of these, snow crystals were grown and melted under very clean conditions inside a diffusion cloud chamber. The results of the three experiments are consistent in failing to detect a separation of charge and in indicating that any charge produced was smaller than  $10^{-2}$  e.s.u./g or 2 orders of magnitude smaller than that reported by Dinger and Gunn. This result was unaffected by varying the purity of the ice, its air content, the rates of freezing and melting, and the pH value of the water. It is concluded that charging associated with the melting of snow or hail is unlikely to be an important feature in the electrification of clouds and precipitation. (Authors' abstract, modified)

SIP 22158

551.578.46(437)

Konček, Mikuláš and Vojtech Briedon  
SNOW AND SNOW COVER IN SLOVAKIA. (Sneh a snehová pokrývka na Slovensku; Text in Slovak with German and Russian summaries). Vydavateľstvo Slovenskej akadémie vied (Bratislava), 71p. incl. tables, graphs, maps, 1964. 19 refs.  
DLC, GB2533.85K8

This report is based on observations made at 208 meteorological stations between 1921 and 1951 during the winter seasons. Tabulated, mapped, and graphed data include an alphabetical listing of the stations and their locations, the dates of occurrence and duration of snowfall, the average number of days with a snow cover 10, 20, and 50 cm in depth respectively, and the over-all average depth of snow cover during each winter period. Data are also given on the average snow depth during April, the average daily snow depth at selected stations, and the average distribution of atmospheric pressure in Feb. 1925, 1929, and 1940 respectively. -- BLE

SIP 22159

551.579.2:778.35(52)

Hanazawa, Masao  
ESTIMATION OF WATER EQUIVALENT OF SNOW COVER BY AERIAL PHOTOGRAPHY. (Koku shashin sokuryo niyoru seikisetsu suiryo no suitei ni tsuite; Text in Japanese). Kisho (Weather), No. 80:6-8 incl. maps, tables, graphs, Dec. 1963.  
DLC, Orientalia Div.

The water equivalent of snow cover in basins of the Kuromata, Kuzuryu and Ibi Rivers in central Japan was estimated. Maps showing snow cover distribution according to depth were drawn from aerial photographs and divided into 7 classes (from 0 to 5.5 m). The water equivalent was calculated as the product of water from each classified zone, and snow density was measured by a snow sampler at a given place in the corresponding zone. In the Kuromata River Basin, the water equivalent was estimated to be  $322 \times 10^6 \text{ m}^3$ ,  $301 \times 10^6 \text{ m}^3$ , and  $243 \times 10^6 \text{ m}^3$  respectively. Variation from results obtained by other methods was 7-32%; therefore, further improvements of snow depth measurement by this method are necessary. -- CST/BLE

SIP 22160

551.345:551.791(\*2)

Dylik, Jan  
NEW PROBLEMS OF THE PLEISTOCENE PERMA-FROST. (Nowe problemy wiecznej zmarzliny plejstocenkiej; Text in Polish with French summary). Acta Geographica Lodziensia, 17 (Lodz), Wyd. 3, 93p. incl. illus., diagrs., 1963. 141 refs.  
DLC, QE573.D9

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New interpretations are presented of periglacial fossil phenomena, based on recent results of permafrost investigations in Siberia, North America, and the Antarctic. Among the topics discussed are the structure and origin of sand-wedge polygons and ice wedges, the formation of ice crevasses and the fossil structure of crevice polygons and their paleogeographic stability, thermokarst, and the formation and degradation of Pleistocene permafrost. -- BLE

SIP 22161

534, 24/. 25:551, 322:681, 14

Roethlisberger, Hans  
REFLECTION AND TRANSMISSION COEFFICIENTS  
AT THE INTERFACE ICE-SOLID. Res. Rept. 110,  
U. S. Army Cold Regions Research and Engineering  
Laboratory, 17p. incl. illus., tables, graphs, May  
1964. 1 ref.  
CRREL files

A Bendix G-15D computer program was developed to produce a table of reflection and transmission coefficients for any combination of solids for angles of emergence from 90° to 0° at any desired increment. Nafe's equations were used to obtain values for the case of ice in contact with another solid at a plane interface. Values of P and S waves were computed for 30 different cases of the second solid which represent the major groups of rocks and compacted frozen or unfrozen soils likely to occur under glaciers. A compressional velocity of 3.6 km/sec, a density of 0.9 g/cm<sup>3</sup>, and a value of 1/3 for Poisson's ratio were assumed for the ice. For the other solid, the velocity ranged from 1.2 to 6.0 km/sec, the density from 1.5 to 3.0 g/cm<sup>3</sup>, and Poisson's ratio from 0 to 1/3. The results are presented as theoretical curves which give the energy ratio (ratio of emergent wave to incident wave), of elastic plane waves reflected or refracted at an ideal plane interface between ice and a solid with the physical properties of soil or rock. For identical density and velocity ratios, the same tables would apply to materials other than ice, in contact with a second solid. (Author's abstract)

SIP 22162

551, 326, 7:539, 42:542

Weeks, W. F. and A. Assur  
STRUCTURAL CONTROL OF THE VERTICAL VARIATION OF THE STRENGTH OF SEA AND SALT ICE. Res. Rept. 113, U. S. Army Cold Regions Research and Engineering Laboratory, 16p. incl. illus., tables, graphs, diags., April 1964. 16 refs.  
CRREL files

Variation in the vertical strength of sea ice was studied by using data on NaCl ice and comparing the similarity of structure and straight-forward phase relations. A series of nested horizontal thin sections was prepared at 0.2-30.2 cm levels below the sur-

face of the test NaCl ice sheet and the plate spacings measured from enlarged photographs. Measurements showed that the distance between centers of adjacent brine layers measured parallel to the c-crystallographic axis is a linear function of the sixth root of the distance below the upper ice surface. Available values of the same parameter for natural sea ice are in good agreement with this relation. Equations giving the dependence of the ring-tensile strength of the ice on the upper surface were developed and specific equations determined by the variation of brine pocket dimensions with changing brine volume. A significant decrease in the volume of brine necessary to cause the ice to have zero strength with increasing distance below the upper ice surface was found as predicted. A new least squares estimate (0.112 mm) of the minimum width of a continuous brine layer before it splits to produce separate brine pockets was obtained which is 60% greater than previous values. It is demonstrated that in NaCl ice sheets the systematic increase in the plate width with depth produces significant changes in the ring-tensile strength of the ice. Field tests previously performed indicate that similar relations hold for sea ice. (Authors' abstract)

SIP 22163

546, 212:536, 421:612, 46

Beutel, Jack  
WATER RECOVERY BY REITERATIVE FREEZING. Tech. Doc. Rept. No. MRL-TDR-62-14, Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio, 65p. incl. illus., tables, graphs, diags., March 1962. 3 refs.  
DLC, Tech. Rept. Collection

A method of recovering potable water from urine by employing the differences in solute concentration of a liquid-ice phase system as a means of purification is discussed. General principles, techniques, and experimental procedure are described. The effect upon the attainable separation due to rate of freezing, agitation, direction of freezing with respect to the gravity direction, and the effect of freezing upon the distribution of micro-organisms is discussed. The energy requirements for the recovery of potable water from urine by various reiterative freezing schemes are calculated as a function of the yield and of the volume of liquid that must be frozen in order to recover a unit volume of water containing less than 500 parts/million of solids. A comparison is made of these energy requirements and the energy requirements of a simple distillation process. (Author's abstract, modified)

SIP 22164

551, 322:539, 139

Fletcher, N. H.  
SURFACE STRUCTURE OF WATER AND ICE - A REPLY AND A CORRECTION. Phil. Mag. 8(92): 1425-1426, Aug. 1963. 3 refs. Correspondence. DLC, Q1. P5

# CRREL BIBLIOGRAPHY

In a recent note (SIP 21191) Watts-Tobin criticizes the present author's paper (SIP 20270) to invalidate its conclusions. He maintains that the oriented layer whose existence was discussed in the original paper cannot possibly be stable because of electrostatic depolarizing effects. In this paper Fletcher concedes that the model used in discussing water and ice surfaces was extremely crude and that a more accurate treatment should include the long-range electrostatic forces. However, the inclusion of these forces affects only the numerical results and leaves the conclusions about the existence of the surface layer unaltered. Contrary to Watts-Tobin's suggestion that the depolarizing field is essentially the same as that in a spherical cavity in a thin dielectric slab, calculations have shown that the depolarization field may be much smaller than predicted from the "point-dipole" model. Equation (26) of the original paper contains an error: the third term on the right hand side should contain an additional factor  $(1 - \exp(-2y/d))$ . Minimization of this free energy expression by numerical methods gives a curve similar to that of Fig. 2, above  $-5^{\circ}\text{C}$ , but below this temperature the film thickness decreases more rapidly and the film vanishes at  $-12^{\circ}\text{C}$ . -- BLE

This article describes the development of the study of ice as a plastic material, and the attempts to confirm theories by investigating present-day glaciers and the traces of prehistoric glaciers. The flow studies also provide useful experience for investigating any flow that might occur in the earth's crust. Measurements were made of the rate of deformation of cylinders of polycrystalline ice under uniaxial compression. Over the stress range  $1-10 \text{ kg/cm}^2$ , the relationship between stress and strain is expressed as  $\dot{\epsilon} = k\sigma^n$  where  $\dot{\epsilon}$  is the strain rate,  $\sigma$  is the stress, and  $n$  and  $k$  are constants. Application of the laws of ice flow to the study of glaciers includes internal deformation and the processes governing the sliding of a glacier over its bed. Until 1950, theoretical studies of glacier flow had treated ice as a liquid with a high, but constant, Newtonian viscosity. In 1951, J. F. Nye treated ice as an ideal plastic which deforms indefinitely once the stress exceeds a certain value. In addition to providing general evidence of conditions during past ice ages, the existing ice sheets contain much detailed evidence of climate, precipitation, and other factors, during past centuries. Other interesting aspects of glaciology include isotope studies and related work on the "Upper Mantle Project." -- BLE

SIP 22165

551.345.1:624.139(+3)

Brown, R. J. E. and G. H. Johnston  
PERMAFROST AND RELATED ENGINEERING  
PROBLEMS. Endeavour, 23(89):66-72 incl. illus.,  
diags., map, May 1964. 14 refs.  
DLC, Q1.E5

The distribution of permafrost in the Northern Hemisphere, typical vertical distribution and thickness, and typical profiles in permafrost regions are illustrated. Above the permafrost is a surface layer of soil or rock, called the "active layer," which thaws in the summer and freezes in the winter. Its thickness depends on the same climatic and terrain features (air temperature, relief, vegetation, drainage, snow cover, and soil type) affecting the permafrost. Three features of permafrost are significant in engineering construction: (1) it is very sensitive to thermal changes, (2) it is relatively impermeable to moisture, and (3) it often contains ice. Approaches to be taken in foundation design and the construction techniques to be used are usually considered under one of the following headings: (1) neglect of permafrost conditions, (2) preservation of frozen conditions for the life of the structure, (3) elimination of frozen condition or material before building, and (4) thawing of frozen ground with expectation of subsequent ground settlement. -- BLE

SIP 22167

624.139.62:621.643

Takashi, T., N. Tobe and S. Miura  
ON THE FIRST APPLICATION OF THE SOIL-  
FREEZING METHOD IN OUR COUNTRY. (Wagakuni  
ni okeru saisho no dojō tōketsuhō no jisshi kiroku;  
Text in Japanese with English summary). Reitō  
(Refrigeration), 38(426):1-13 incl. illus., tables,  
graphs, diags., April 1963. 9 refs.  
DLC, Orientalia Div.

A city water main (1.5 m in diam.) within a Hume pipe (1.8 m in diam.) was laid in a soft soil region under a waterway in Moriguchi City, Osaka, Japan. The soil (5 m in diam. and 39 m long) was frozen by a 25-ton-75-KWH refrigerator. The freezing took 3 weeks, and 40-50 tons of pressure were needed to drive the Hume pipe. Four points to be considered when conducting such an operation are: (1) effective frozen zones, while driving remaining pipe, (2) accuracy in laying the freezing pipe (must be within  $\pm 10 \text{ cm}$  error for 15 m of pipe), (3) effect of underground water flow on freezing, (4) short construction thawing time. Winter construction cost would be 30 to 40% less. -- CST/BLE

SIP 22168

551.578.4:551.501.81(52)

Fukatsu, H.  
ON THE SNOW FLURRIES IN TOKAI AND KOKURIKI  
DISTRICTS AS SEEN BY RADAR ECHO. (Rādāekō  
yori mita tōkai hokuriku chihō no yukishigure ni  
tsuite; Text in Japanese). Tenki (Weather), 10(11):  
13-17 incl. graphs, maps, Nov. 1963. 2 refs.  
DLC, Orientalia Div.

SIP 22166

551.324

Rouin, G. de Q.  
GLACIOLOGY. Endeavour, 23(89):102-107 incl.  
table, graphs, diags., map, May 1964. 24 refs.  
DLC, Q1.E5

# CRREL BIBLIOGRAPHY

A PPI (plan position indicator) sketch and photograph were made from the results of radar observations taken in Jan. and Feb. 1962, in Hokuriku and Tokai districts. Twelve examples of typical winter pressure distribution were selected in order to study the relations between radar echo, wind in the upper atmosphere, and weather conditions (particularly snow flurries) near the ground. The line-shaped echo was 20-30 km wide and 100-150 km long at an altitude of 2000-4000 m. In Hokuriku district, the snow flurry was caused by a short-period wave of instability. In Tokai district, the flurry was caused by the same instability line which had weakened when passing Wakasa and Ise Bays, Biwa Lake, and other valleys. In the other districts, no snow flurries were observed because of total instability line weakening over the mountain areas. -- CST/BLE

SIP 22169

551, 326, 83:551, 579, 4(52)

Muraki, Y. and S. Kamada  
SURVEY REPORT ON ICING CONDITIONS ON THE ISHIKARI RIVER (REPORT 4) -- PARTICULARLY ON THE WATER FLOW AND MUD CONTENT IN THE WATER BELOW THE COMPLETELY FROZEN SURFACE. (Ishikari-ka no keppyo chosa hokoku (dai 4 ho) -- tokuni zenmen keppyo-ka no ryu-ryu to ryudeiryu ni tsuite; Text in Japanese). Hokkaido Kaihatsukyoku Doboku Shikenjo Geppo (Hokkaido, Bureau of Resources, Mo. Rept., Civil Eng. Testing Lab.), No. 125:1-12 incl. illus., graphs, diagrs., Nov. 1963. 3 refs.  
DLC, Orientalia Div.

Water-level, ice thickness, flow speed, and mud content were measured almost every day from Jan. 25 to Feb. 25, 1963, at Ebetsu where the river width is 200 m. Flow speed was measured at points 25 cm, 40 cm, 70 cm, 100 cm, etc., from the river bed up to the ice cover. The water was sampled for mud-content at 3 depths: 20 cm from the river bed, immediately under the ice cover, and midway between these 2 points. The vertical movement of the ice cover depended largely on the cross section flow, flow speed distribution, and water level. Water level vs. cross section flow and water level vs. water flow relations could be expressed by definite curves when the icing conditions were uniform. No correlation was observed between average flow speed and mud content. Variations of the river bed were less than 10 cm in most places. -- CST/BLE

SIP 22170

551, 326, 83:551, 579, 4(52)

Kamada, S.  
SURVEY REPORT ON ICING CONDITIONS ON THE ISHIKARI RIVER. (Report III). (Ishikari-ka no keppyo chosa hokoku (dai 3 ho); Text in Japanese). Hokkaido Kaihatsukyoku Doboku Shikenjo Geppo (Hokkaido, Bureau of Resources, Mo. Rept., Civil Eng. Testing Lab.), No. 109:2-18 incl. illus., tables, graphs, diagrs., July 1963. 10 refs.  
DLC, Orientalia Div.

The freezing period of the Ishikari River was shorter in 1961 than in the previous 2 years; therefore, the breakup of the central portion of the ice cover came 1 month earlier. As a result of the 1961 observations, additional data were obtained on the vertical movement of the ice cover and on the thawing process; methods of forecasting the breakup time of the ice cover were improved; graphs were drawn which show the increasing ice-cover thickness at Ebetsu; the relation between the flow condition below the river ice and the mud content during winter and summer months was investigated; and the icing conditions were studied along the entire river by aerial photography and by drawing the vertical section of the ice cover. (See SIP 19362 and 19887)  
-- CST/BLE

SIP 22171

624, 139, 62:621, 643

Yasukura, Yasunori and Kusuo Okazaki  
THE SOIL FREEZING METHOD. (Dojo toketsuhō; Text in Japanese). Tetsudō doboku (Railway Civil Eng.), 5(8):9-12 incl. illus., table, diagrs., Aug. 1963.  
DLC, Orientalia Div.

The soil freezing method was applied to lay a Hume pipe (1.8 m in diam. and 26 m long) through a waterway bed at Moriguchi City, Osaka, Japan. A vertical shaft was dug on both sides of a bridge from which 18 freezing pipes (90 mm in diam. and 14 m long) were driven around the area where the Hume pipe was to be laid. A Hitachi H. M. C. -100 HP freon 22 refrigerator was used with a CaCl<sub>2</sub> solution at -25°C. The ground temperature during the operation was 18°C before freezing, and -3°C to -16°C during freezing. The average temperature was -8°C.  
-- CST/BLE

SIP 22172

551, 322:541, 5

Cohan, Morah V. and Jariana Weissman  
VALENCE DEFECTS IN ICE. Nature, 201(4918): 490 incl. table, Feb. 1, 1964. 7 refs.  
DLC, Q1.N3

# CRRRL BIBLIOGRAPHY

Dunitz (SIP 21190) has proposed a new model (the X defect) for the valence defects in ice which he considers to be energetically more favorable than the model (a modified Bjerrum's D defect with both molecules rotated) proposed previously by the present authors (SIP 20302). The results of new calculations are given, based on the authors' point charge model, for Dunitz's X defect and the modified D defect. It is concluded that there is no difference, from an energetical viewpoint, between an X and a rotated D defect. The general idea of rotation is adequate, but more calculations are needed to decide the particular form of the rotation. -- BLE

SIP 22173 550.93:551.578.4:546.02:546.815:(\*7)

Crozaz, G., E. Picciotto and W. De Breuck  
ANTARCTIC SNOW CHRONOLOGY WITH Pb210. *J. Geophys. Res.*, 69(12):2597-2604 incl. tables, diagrs., June 15, 1964. 20 refs.  
DLC, QC811.J6

After a short discussion on the Pb210 dating method, the results of Pb 210 measurements on snow and firn samples from four Antarctic stations (Amundsen-Scott, Byrd, McMurdo and Roi Baudouin) are reported as well as the experimental procedure used. Pb210 was also measured in the air at ground level at Roi Baudouin Station, the average Pb210 activity of aerosols in 1958 being  $1.3 \times 10^{-3}$  dpm/kg of air. In samples of surface snow accumulated during the last two to five years, the average Pb210 activity is of the order of 100 dph/kg of snow. This activity seems to be independent of the local rate of accumulation. The variations of Pb210 activity as a function of depth were studied on two vertical firn profiles spanning an interval of more than 200 years, at Roi Baudouin, and at Amundsen-Scott Station. Within experimental errors, the Pb210 activity was found to decrease exponentially with depth at both stations. The most plausible interpretation is that the rate of water accumulation and the initial Pb210 concentration in the snow have remained constant at both places over the last 100 years. The annual rates of water accumulation calculated from the decay curves are  $6 \pm 1$  cm at Amundsen-Scott and  $45 \pm 3$  cm at Roi Baudouin, in good agreement (to better than 10%) with accumulation rates so far obtained by other methods. (Authors' abstract)

SIP 22174 551.510.42:523.16:54.06

Wright, Frances W., Paul W. Hodge and Chester C. Langway, Jr.  
STUDIES OF PARTICLES FOR EXTRATERRESTRIAL ORIGIN. 1. CHEMICAL ANALYSES OF 118 PARTICLES. *J. Geophys. Res.*, 69(19):5575-5587 incl. illus., tables, graphs, Oct. 1, 1963. 30 refs.  
DLC, QC811.J6

Dust particles of probable or known extraterrestrial origin were gathered, for the purpose of comparison, from a number of sources, including the stratosphere, 750-year-old Greenland ice, 85-year-old Antarctic ice, the Antarctic atmosphere, a New Mexico mountain-top, glacial ice caves, and the place of fall of the Siberian Sikhote-Alin meteorite shower. Out of the wide variety of types of particles in these samples, 118 representative particles were subjected to detailed chemical analysis by the electron-beam microanalyzer technique. The Fe/Ni ratios of 5 particles point undoubtedly to their meteoritic origin. From their high Fe/Si ratio some 35 others are thought to be extraterrestrial. A few objects are identified from their compositions as being of obvious terrestrial origin. The cosmic influx of dust on the earth's surface is computed to be more than  $10^6$  tons per year. (Authors' abstract, modified)

SIP 22175 551.510.42:523.16:54.06  
551.217.24:54.06:(79)

Hodge, Paul W. and Frances W. Wright  
STUDIES OF PARTICLES FOR EXTRATERRESTRIAL ORIGIN. 2. A COMPARISON OF MICROSCOPIC SPHERULES OF METEORITIC AND VOLCANIC ORIGIN. *J. Geophys. Res.*, 69(12):2449-2454 incl. illus., tables, June 15, 1964. 9 refs.  
DLC, QC811.J6

Dust deposits from five Pacific Coast volcanoes were sampled to search for and analyze microscopic volcanic spherules that might possibly be similar to the supposed meteoritic spherules found in polar ice sediments. In the size range 10 to 100  $\mu$ , approximately  $2 \times 10^{-5}$  of volcanic particles are perfect or nearly perfect spherules, and  $2 \times 10^{-3}$  of them are rough magnetic spheroids. Chemical analysis, using an electron-probe microanalyzer, shows them to be made up typically of 0.4 Fe, 0.2 Si, 0.1 Al, 0.03 Ti, and 0.01 K. In composition they are similar to only a few of the polar glacier particles analyzed. In addition, the numerical ratio of spherules to irregular particles for the volcanic dust is so different from that for the ice sediments that a volcanic origin for the latter seems impossible. Therefore, a meteoroidal origin for the Arctic and Antarctic spherules is still the most reasonable hypothesis. (Authors' abstract, modified)

SIP 22176 551.510.42:523.16:54.06:551.322:  
(\*38,\*7)

Hodge, Paul W., Frances W. Wright and Chester C. Langway, Jr.  
STUDIES OF PARTICLES FOR EXTRATERRESTRIAL ORIGIN. 3. ANALYSES OF DUST PARTICLES FROM POLAR ICE DEPOSITS. *J. Geophys. Res.*, 69(14):2919-2931 incl. illus., tables, graph, July 15, 1964. 27 refs.  
DLC, QC811.J6

# CRREL BIBLIOGRAPHY

A total of 166 dust particles collected principally from Greenland and Antarctic ice was chemically analyzed by the electron-beam microanalyzer technique. The particles apparently consist of meteoritic ablation droplets, micrometeorites, irregular meteoric fragments, ablation spherules of probable cosmic origin, and terrestrial dust deposits. Data from many sources indicate a fairly uniform rate of deposition of opaque spherules over the earth. A tabulation of the particles lists number, source site (Greenland, Antarctic, New Mexico, Sikhote-Alin meteorite shower), type, mean diameter, per cent of element by weight, and remarks. -- JFS

SIP 22177

551.58-551.584:(\*)7

Dalrymple, P. C.  
ANTARCTIC MICROMETEOROLOGY AND CLIMATOLOGY. In: Contributions to the Seminars on the Stratosphere and Mesosphere and Polar Meteorology, July 7-19, 1963, Montreal, McGill Univ., Arctic Meteorol. Res. Group, Publ. Meteorol. No. 65:223-229 incl. tables, graphs. (Contract AF 19(604)-8431, Proj. 8628, Task 862807, Scient. Rept. No. 9, AFRL 64-197), Jan. 1963.  
DLC, Tech. Rept. Collection

Micrometeorology programs in glaciology were conducted at Little America Station in 1957 and at Amundsen-Scott Station in 1958. Monthly mean temperatures are presented for all depths and heights measured at Amundsen-Scott in 1958, and monthly mean wind speed profiles are shown for Jan.-Nov. 1958. Each mean temperature was computed from about 12,000 observations during the month. Monthly plots of mean wind speed profiles show that logarithmic conditions existed in the first 8 m during mid-summer, and that profiles were logarithmic only to 200 or 400 cm, depending upon stability, during the winter. Surface inversions in the lower 8 m were related to the over-all inversions. The total inversion at interior stations in East Antarctica showed higher inversions of greater intensity than those measured at Amundsen-Scott and Byrd Stations. A comparison of firn temperature versus mean annual temperatures for Byrd, Amundsen-Scott, Komsomol'skaya, Vostok, and Pionerskaya show that Byrd's firn and mean annual temperatures are within 0.1°C, while the firn temperatures for the other sites are from 0.9° to 1.7°C colder. Albedo measurements are discussed and a climatic classification for the Antarctic plateau is presented. Temperature, wind speed, and solar radiation are the most important climatic elements for the polar regions. -- JFS

SIP 22178

551.322:539.61:621.763

Hobbs, P. V. and B. J. Mason  
THE SINTERING AND ADHESION OF ICE. Phil. Mag., 9(98):181-197 incl. illus., graphs, diagrs., Feb. 1984. 15 refs.  
DLC, Q1.P5

Results are described of measurements made on the rates of sintering of polycrystalline and single crystals of ice, in the form of spheres 50 μ to 700 μ in diam., in the temperature range -3°C to -20°C. Two spheres in point contact form a system which is not in thermodynamic equilibrium because the total surface-free energy is not a minimum. Under a sufficient driving force, a neck will form between the spheres to decrease the total surface area. Theoretical expressions are given which explain the possible ways in which the neck may receive material from elsewhere in the system. The spheres were formed by freezing water droplets from a hypodermic needle in a hollow metal tube that was 2 ft long and surrounded by solid CO<sub>2</sub>. The results are in quantitative agreement with the new evaporation-condensation theory. Further confirmation was obtained from experiments with spheres of heavy ice, and by the observed effects of replacing the air by either hydrogen or silicone oil. The sintering of ice by either volume or surface diffusion would be slower by almost 4 orders of magnitude. No evidence is found for the recent suggestion that the sintering and adhesion of pure ice is caused by the existence of a liquid-like surface-layer. The ice spheres show symptoms of having such a liquid layer only if they contain dissolved salts or if their surfaces are otherwise contaminated. -- BLE

SIP 22179

616.5-001.19(047.1)

McDade, Harry C.  
FROSTBITE - A REVIEW. Appalachia, 38(12):233-241, Dec. 1962. 26 refs.  
DLC, G505.A55

The basic pathology of frostbite is the injury produced by the freezing of tissues, which may be severe enough to lead to necrosis and tissue death. There is a relationship between the degree of cold, the rapidity with which freezing occurs, the size of the ice crystals formed, the rate of thawing, and the resultant injury. The injury is generally classified into four degrees of severity: first degree - hyperemia (redness) and edema (swelling); second degree - hyperemia with vesicle (blister) formation; third degree - necrosis (death) of the skin and subcutaneous tissues; fourth degree - complete necrosis and loss of tissue; rewarming never occurs. The treatment of frostbite depends on the stage at which it is seen (still frozen, or thawed) and the facilities at hand. Ideally, the frozen part should undergo rapid rewarming in a controlled (108°-112° F) water bath. Once the part has been thawed, either rapidly, or with exposure to room air in the range of 70° to 80° F, the following steps should be taken: restora-

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tion of body temperature, strict bed rest, tetanus prophylaxis, antibiotics, vitamins and regular diet, avoidance of smoking, asepsis, and delay of amputation. Treatment under adverse conditions must be the result of a compromise dictated by terrain, weather, and party survival. -- JFS

SIP 22180

551.328.4:535.43:551.521.1

Lyubomirova, K. S.  
CHARACTERISTICS OF SOLAR RADIATION SCATTERING IN A FRAZIL ICE LAYER. (Osobennosti rasseivaniya solnechnoy radiatsii v tolayshche mutnogo l'da; Text in Russian). Inform. sbornik o rabotakh po Mezhdunarod. Geofiz. Godu, No. 9:145-155 incl. tables, graphs, 1962. 6 refs.  
DLC, Slavic Div.

A set of calculations is presented for the determination of the penetration of radiation into an ice layer. A relationship between the attenuation coefficient of total radiation and the ice thickness was obtained. From the data of 60 observations, values were obtained for the solar radiation penetrating to various depths, and mean values were calculated for the change of radiation intensity with depth in percent of incident radiation. Radiation intensity which has penetrated the ice layer is about 25% and 10% of the radiation which has entered the surface to depths of 5 and 25 cm, respectively, and about 2% at a depth of 40 cm. A value was obtained for a dimensionless function which shows what part of the light flux, attenuated in a known thickness of ice as a result of secondary scattering, proceeds into the body of ice. The dependence of this function on the ice thickness is presented analytically. Also, an estimate was made of the increase in the path of solar rays in frazil ice due to secondary scattering by air bubbles trapped in the ice. For ice with a density of 0.87 to 0.89 g/cm<sup>3</sup>, this increase was found to be 4.2 times greater than the length traveled by solar rays in transparent ice. (RZh, Geofizika abstract)

SIP 22181

532.56

Odar, Fiat  
FORCES ON A SPHERE ACCELERATING IN A VISCOUS FLUID. Res. Rept. 128, U. S. Army Cold Regions Research and Engineering Laboratory, 18p. incl. illus., tables, graphs, diagrs., March 1964. 25 refs.  
CRREL files

A study of the determination of the forces exerted by a fluid due to the relative velocity and acceleration of a sphere is presented, and previous work on rectilinear motion of bodies in a still fluid and the rectilinear motion of a fluid past fixed objects is reviewed. Experimental procedure, equipment, and tests are described. A formula is given for determining the

resisting forces acting on a sphere moving rectilinearly in a viscous fluid, in terms of sphere radius, fluid density and viscosity, object velocity in the fluid, object acceleration, and force coefficients. The latter were determined experimentally by measuring the forces on a sphere moving sinusoidally within the range of  $0 < Re$  (Reynolds number)  $< 62$ . (Author's abstract)

SIP 22182

551.322:539.6

Stallabrass, J. R. and R. D. Price  
ON THE ADHESION OF ICE TO VARIOUS MATERIALS. Can. Aeronautics and Space J. 8(7):199-204 incl. tables, graphs, diagrs., Sept. 1963. 6 refs.  
DLC, TL501.Q27:3

See SIP 20776: NRC Rept. 6960 (Aeronautical Rept. LR-350), Div. Mechanical Eng., Natl. Res. Council, Can., 12p., July 1962.  
ASTIA, AD 287054

SIP 22183

551.513.1:551.324.6(+3)

But, I. V.  
THE CORRELATION BETWEEN THE GENERAL CIRCULATION OF THE ATMOSPHERE AND THE PRESENT DISTRIBUTION OF GLACIERS IN THE NORTHERN HEMISPHERE. (O sootvetstviy mezhdu obshchey tsirkulyatsiei atmosfery i sovremennym raspredeleniem lednikov v severnom polusharii; Text in Russian). Inform. sbornik o rabotakh po Mezhdunarod. Geofiz. Godu, No. 9:10-39 incl. tables, graphs, 1962. 33 refs.  
DLC, Slavic Div.

The primary importance of meridional types of atmospheric circulation for the occurrence of precipitation in glaciated regions of the polar zone is noted, and consideration is given to the factors which determine the supply conditions of glaciated regions in other zones. A classification of the glaciated regions is proposed which is based on the circulatory features of the atmosphere. A close relationship is noted between the present conditions of atmospheric circulation and characteristics of present glaciation of the Northern Hemisphere, with the exception of the relict (Greenland) glaciated region, where the mid-latitude circulation of past epochs determined the basic features of its present morphology. (RZh, Geofizika abstract)

# CRREL BIBLIOGRAPHY

SIP 22184

612, 592

Hall, William H.  
MEDICAL PROBLEMS OF MILITARY OPERATIONS  
IN EXTREMES OF HEAT AND COLD. Military Med.  
129(7):641-651, July 1964. 18 refs.  
DLC, RD1.A7

Man maintains his thermal balance in the cold by diminishing heat loss and increasing heat production. Heat production is increased as a result of shivering. Acclimatization is characterized by increased metabolic heat production which occurs in response to cold exposure and without associated shivering. The clinical sequelae of damaging cold exposure are determined by the severity and duration of the exposure. Additional qualifying factors are also involved which include age, extent and severity of associated total body chilling, race, physical fitness, acclimatization, and many other recognized and unidentified modifying circumstances. In non-freezing injury, exposure of many hours or many days to cold wet conditions above freezing is the characteristic cause. The circumstances which produce tissue freezing is speculative. The incidence and severity of frostbite (a freezing injury) depend upon the interaction of environmental (weather, clothing, and intensity of combat) and host factors. Also discussed are diagnosis and classification of cold injuries, prognosis, prevention, and clothing for cold weather operation. -- BLE

SIP 22185

601, 32:624, 142(52)

Nagakura, Tadashi  
FUNDAMENTAL STUDIES OF THE EFFECTS OF  
MIX CONDITIONS ON THE FROST RESISTANCE  
OF CONCRETE. (Konkurito no haigō shōjōken ga  
tōkatsu teikōsei ni oyobosu eikyō ni kansuru  
kisoteki kenkyū; Text in Japanese with English sum-  
mary). Doboku gakkai ronbunshū (Transactions of  
the Japan Society of Civil Engineers), No. 98:15-25  
incl. illus., tables, graphs, Oct. 1963. 27 refs.  
DLC, Orientalia Div.

This report summarizes the results of experimental studies of the effects of water-cement ratio, sand percentage, cement content, air content, etc., on the frost resistance of concrete. It is concluded that frost resistance increases immensely from air entrainment and that without variation of the air content, the water-cement ratio is the most important factor. It is also pointed out that the sand content is an important factor and that when the other factors remain constant, cement content and water content generally do not affect the frost resistance of concrete. Changes in concrete by freezing and thawing is caused primarily by the permeation of water from the exterior. An experimental method to evaluate the effects of the mix conditions and materials on the frost resistance of concrete was obtained. (From author's summary)

SIP 22186

551, 501.9

Sato, Yoshimasa  
ON THE INSTRUMENT SHELTER WITH SLIDING  
FRAMEWORK FOR HEAVY SNOW REGIONS.  
(Shinsetsuyo kuridashishiki hyakuyobako; Text in  
Japanese). J. Meteorological Res. 14(9):27-30  
incl. diags., Sept. 1962.  
DLC, Orientalia Div.

The correct method of measuring air temperature in a heavy-snow region is to keep the bottom of the thermometer shelter about 1 m above the snow surface. Various types of height-adjustable thermometer shelters are described. A simple sliding-frame work type is proposed for regions of rapid snow accumulation. The shelter can be adjusted by worm-gear action to heights of 100, 150, 200, and 250 cm, and can be operated with one hand. -- CST/BLE

SIP 22187

629, 135, 45:624, 148, 7(\*3)

White, Billy L.  
CATEGORY II LOW TEMPERATURE EVALUATION  
OF A YUH-1D HELICOPTER IN THE ARCTIC.  
Tech. Doc. Rept. No. ASD-TDR-63-564, Deputy  
for Flight Test Aeronaut. Systems Div., Air Force  
Systems Command, Wright-Patterson Air Force  
Base, Ohio, 153p. incl. illus., tables, graphs,  
diagra., appendixes 1-3, Sept. 1963.  
DLC, Tech. Rept. Collection; DDC, AD 422643

The model YUH-1D helicopter was tested at temperatures down to -51° F in the Arctic at Eielson AFB, Alaska, during the period of Dec. 20, 1962 through Jan. 17, 1963. Data are presented that were collected during the test and the deficiencies that were encountered are discussed and analyzed. The most significant deficiencies were excessive engine oil pressure during starts below -20° F and erratic operation of the bleed-air-driven fuel boost pump. The helicopter can be expected to operate successfully in an Arctic environment if corrective action is taken as outlined in the Recommendations of this report. (Author's abstract, modified)

SIP 22188

551, 579, 5:551, 345(51)

Feng-t'ung, Lin  
EXPERIENCES IN SEARCHING FOR UNDERGROUND  
WATER IN THE PERMAFROST AREAS OF TA-  
HSIAO-AN RIDGE. (Ta hsiao Hsing-an-ling yung  
chiu tung t'u ti ch'u hsun chao ti hsia shui ching yen;  
Text in Chinese). Shui wen ti chih kung ch'eng ti  
chih (Hydrogeology and Engineering Geology), No. 6:  
37-40 incl. diags., 1959. (Eng. transl.: U. S.  
Dept. Commerce, Office Tech. Services, Wash.  
25, D. C., JPRS 10298, Sept. 28, 1961).  
DLC, Orientalia Div.



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Underground water in permafrost areas may be divided into 3 principal types: suprapermfrost water, intra-permafrost water, and sub-permafrost water and fissure springs. Methods of searching for ground water include interviewing local inhabitants, observing the variations of snow accumulation and landscape and vegetation, the river survey method, and composite methods (geologic, electrical resistivity, and drilling). Questions such as water or spring locations, flow rates, seasonal fluctuations, and permanence can be answered through interviews. Since ground water has a comparatively higher temperature, and contains a specific amount of heat, snow does not accumulate in areas where ground water is located near the earth's surface or where it springs. Peculiar landscape features prevail in the permafrost areas of the Great and Lesser Khingan Mountain Ranges, such as ice rivers, frost boils, etc., which result from the action of ground water. In permafrost areas, plants are usually less viable, and the diameter of the growth rings is smaller. Where ground water is present, the plant foliage is dull gray or yellow, the tree roots are not firmly implanted, and the trunks are tilted and show a dying state. -- BLE

SIP 22189 551, 579, 2:551, 508, 77(52)

Onuma, Masayuki  
STUDY OF SNOW MELTING PROMOTION BY USING A HELICOPTER -- PRELIMINARY EXPERIMENT OF BLACK POWDER SPREADING. (Herikoputā niyori yūsetsu: sokuishin ni kansuru kenkyū kokushoku fun-matsu no sunpu hoho ni kansuru yōbi jikken; Text in Japanese). Seppyo, 25(4):10-13 incl. tables, graphs, diagra., July 1963.  
DLC, Orientalia Div.

The melting of a snow cover was promoted by spreading black powder, e.g. snow melt, carbon, etc., from a helicopter. The reflection coefficient was decreased from 50-90% to 10-20%, thereby increasing solar-heat absorption. The experiment took place on Feb. 20, at Takada, Japan. The snow depth was 140 cm, the density was 0.37 g/cm<sup>3</sup>, the water content was 8%, and the nocturnal freezing depth was 6-7 cm. Four flights were often necessary in order to obtain the desired melting rate (8-10 kg/acre). Homogeneity of the spreading was examined by photograph. The decrease in snow cover depth and snow density were studied. -- CST/BLE

SIP 22190 551, 579, 2:551, 508, 77(52)

Inoue, Rikita  
MEASUREMENT OF WATER EQUIVALENT OF SNOW COVER WITH A SNOW BALANCE. (Hakari-gata sekisetsu suiryōkei niyori sekisetsu suiryō no kansoku; Text in Japanese with English summary). Seppyo, 20(6):6-13 incl. illus., tables, graphs, Nov. 1958. 4 refs.  
DLC, Orientalia Div.

The water equivalent of snow cover was measured with the "Snow Balance," a newly designed snow gage. The gage consists of 8 triangular plates connected to each other in the form of an octagon and set flush on the ground. A ring balance supports the center of the octagon. Each triangular plate moves around the circumference of the octagon thereby permitting the ring balance to measure the weight of the snow on the plates. The ring strain is magnified 82 times and recorded on the drum which is situated 4 m from the center of the plates. It is concluded that the snow gage is fully practicable for field use. Theoretical considerations and results are explained. (See SIP 22191) (Author's abstract, modified)

SIP 22191 551, 579, 2:551, 508, 77(52)

Inoue, Rikita  
ON MEASURING WATER EQUIVALENT OF SNOW COVER WITH A SNOW BALANCE. (Hakari-gata sekisetsu suiryōkei niyori sekisetsu suiryō no kansoku; Text in Japanese with English abstract). Seppyo, 25(4):1-9 incl. tables, graphs, diagra., July 1963. 7 refs.  
DLC, Orientalia Div.

Improvements were made in the original "Snow Balance" apparatus (SB-4) (SIP 22190) which increase the sensitivity 17.5 times and prevent the occurrence of drift. The magnifying mechanism was removed, and the ring balance movement was made to be transmitted electrically, directly to a differential transformer and recorded. The new model (SB-2) is 2 m in diam. and has a load cell with strain gages in it. Simultaneous observations were made with both instruments in order to ascertain the accuracy. Due to evaporation or precipitation, the quantity of water contained in the soil as indicated on the pressure dial will change almost unceasingly, thus causing readings to change even with no snow cover. No serious faults have been found in the improved model. (Author's abstract, modified)

SIP 22192 521, 315:551, 574(52)

Shōda, Mikio  
SNOW DAMAGE ON POWER LINES. (Densenro no setsugai taisaku; Text in Japanese). Seppyo, 25(1): 8-10 incl. table, graphs, diagra., Jan. 1963. 3 refs.  
DLC, Orientalia Div.

Past studies on snow damage to power lines are reviewed, and the conditions necessary for power-line icing were investigated along with the dependence of icing thickness on snowfall and snow density. Estimated and actual values of icing thickness are compared, and the frequency of occurrence of icing during the past 10 yr is graphed. The recoverable limit of sagging power lines is also discussed. -- CST/BLE

# CIREL BIBLIOGRAPHY

SIP 22193 624, 144, 53:551, 321, 37:65, 015, 14(52)

Furukawa, Iwao  
TIME-MOTION STUDY OF SNOW REMOVAL BY  
MAN POWER. (Jinriki josetsu bugakari no kenkyū;  
Text in Japanese). Seppyo, 25(1):3-7 incl. illus.,  
graphs, diagr., Jan. 1963.  
DLC, Orientalia Div.

The amount of snow that can be removed by one man  
in a day was studied with the aid of a moving picture  
camera. The snow shovel which was used weighed 2  
kg and the blade was 25 x 30 cm. The size of a  
shovelful of snow was 0.02 m<sup>3</sup>. Snow density was  
measured by a cone-type penetrometer. The time  
required to cut the snow cover and each motion of the  
shoveling process were studied. The relation be-  
tween the size of a shovelful of snow and the snow  
density was investigated as well as the relation be-  
tween snow cover height and throw distance. The  
amount of snow removed was estimated to be 41  
m<sup>3</sup>/day. Efficiency depends on the nature of the  
snow, and the height and distance a shovelful is  
thrown. -- CST/BLE

SIP 22194 551, 578, 46:531, 754:634, 181, 65(52)

Watanabe, Shigeo and Yoshio Ozeki  
THE PRESSURE OF DEPOSITED SNOW IN THE  
FOREST. (Rinnai set sasu ni tsuite; Text in Japa-  
nese). Seppyo, 25(1):1-2 incl. tables, graphs,  
diagrs., Jan. 1963.  
DLC, Orientalia Div.

The effect of snow pressure on forests was studied  
during the winters from 1958-1961, at Tokamachi,  
Japan. The forest area was 70 m x 140 m with a  
26-37° slope. The trees were 70 yr old and the tree  
density was 900/ha. Snow pressure was measured  
from the amount of dislocation of lead cones which  
were attached to 50-cm-high wood posts distributed  
at 21 points in the forest. The snow pressure was  
estimated to be 25-200 kg/100 cm<sup>2</sup>, and the effective  
area was 1.7-22.5 m<sup>2</sup>/tree. -- CST/BLE

SIP 22195 551, 33:551, 43(\*423)

Loken, Olav  
ON THE VERTICAL EXTENT OF GLACIATION IN  
NORTHEASTERN LABRADOR-UNGAVA. Can.  
Geographer, 6(3-4):106-119 incl. illus., tables,  
diagrs., maps, Winter 1962. 42 refs. Discussion.  
DLC, G1.C28

Observations were made in the area between  
Kangalaksiorvik and Ekortarsuk Fjords during the  
summers of 1959 and 1960. The mountain slopes  
were divided into 3 horizontal zones. The lowest  
zone is characterized by abundant evidence of glacial  
action. In the middle zone rock exposures are much  
more frequent, and evidence of substantial weather-

ing is present. Exposures give way to mountain-top  
detritus or block fields, which cover the upper zone  
where outcrops are few and restricted to steep  
slopes. The distribution of the glacial-morphological  
evidence might be explained by assuming increasing  
intensity of weathering with increasing height above  
sea level, but this fails to explain the very rapid  
transitions which take place at the boundary lines.  
It is therefore concluded that the boundaries were  
formed by the valley glaciers during 2 important gla-  
cial phases. The upper zone shows no glacial-mor-  
phological feature to prove that it has been glaciated;  
other areas are compared; and the age of the upper  
trimline and the Saglik level is discussed. -- BLE

SIP 22196

551, 465(\*60)

Collin, A. E.  
OCEANOGRAPHY IN THE CANADIAN ARCTIC. Can.  
Geographer, 6(3-4):120-128 incl. graphs, maps,  
Winter 1962. 13 refs.  
DLC, G1.C28

The history of oceanographic investigations in the  
Canadian Arctic is reviewed, and information is pre-  
sented about bathymetry, circulation, sea ice, and  
characteristics of its water masses. The typical  
depth of the continental shelf bordering the western  
Arctic islands is about 550 m over a width of from a  
few miles along the north coast of Ellesmere Island  
to over 100 mi in the Beaufort Sea area. On the  
eastern coast the continental shelf is about 200 m  
deep and is seldom more than 30 mi wide. In the  
vicinity of Ellef Ringnes Island the coastal slope ex-  
tends 37 mi seaward to a depth of over 400 m. The  
inland waters of the archipelago seldom exceed the  
depth of the coastal shelves. To the north of the  
archipelago the Canada Basin forms the source for  
the circulation through the islands. To the east,  
Baffin Bay and the Labrador Sea contribute to the  
circulation in the major channels of Lancaster Sound  
and Hudson Strait. The general pattern of the sur-  
face circulation through the archipelago and the  
Hudson Bay system is from northwest to southeast  
and counterclockwise, respectively. Subsurface  
counter-currents are prevalent in the eastern pas-  
sages. The channels of the archipelago and Hudson  
Bay are covered with ice for at least 6 months of the  
year. Most of the sea ice in the eastern Arctic is  
generally not more than one year old. The only sea-  
sonal variation of the water masses is the develop-  
ment of slightly higher temperatures and a brackish  
layer at the surface coinciding with ice decay and  
melt-water drainage. Temperature and salinity data  
are given. -- BLE

# CRREL BIBLIOGRAPHY

SIP 22197

551.326.62(\*60)

Dunbar, Moira

THE DRIFT OF NORTH POLE 7 AFTER ITS ABANDONMENT. Can. Geographer, 6(3-4):129-142 incl. illus., tables, maps, Winter 1962. 19 refs.  
DLC, G1.C28

This paper discusses the possible drift routes taken by the Russian ice-floe station, North Pole 7; previous comparable drifts; the drift pattern and winds at the point of abandonment; and the ice conditions in Baffin Bay and Davis Strait. The station was abandoned on April 11, 1959, at 85° 14' N, 33° 03' W, or about 70 nautical miles north of Cape Morris Jesup, Greenland. Two years later, on April 9, 1961, the remains of it were seen and photographed by the R.C.A.F. at 70° 28' N, 67° 30' W, or about 16 mi east-southeast of Cape Christian, Baffin Island. The abandoned station was frozen into the fast ice near the edge of a very large polar floe. -- BLE

SIP 22198

551.51(\*3)

Longley, Richmond W.

SUPER-ADIABATIC LAPSE RATES IN THE CANADIAN ARCTIC. Can. Geographer, 6(3-4):143-150 incl. tables, graphs, Winter 1962. 9 refs.  
DLC, G1.C28

Upper air reports from Canada's Arctic islands frequently indicate that the area next to the surface has an adiabatic or superadiabatic lapse rate. In the analysis of ascents over Ice Island T-3 to study inversions, the occurrence of a mixing layer (where the temperature decreases or remains constant with height) was noted. Arctic ascents also show thin layers aloft with an adiabatic lapse rate. The data (obtained 1959-1960) used in this study are from 6 Arctic stations: Alert, Eureka, Isachsen, Mould Bay, Resolute, and Sachs Harbour. Because the data were given with pressure as the height variable, the lapse rates were calculated in units of °C/mb. The lapse rate is 3.4 times the adiabatic lapse rate when the air has a zero density gradient with height, as it is in the homogeneous atmosphere. Also discussed are the distribution and characteristics of unstable layers, the relationship between layer thickness and temperature gradient, and the persistence of the layers. -- BLE

SIP 22199

551.345.1(\*41)

Brown, R. J. E.

A REVIEW OF PERMAFROST INVESTIGATIONS IN CANADA. Can. Geographer, 6(3-4):162-165, Winter 1962. 12 refs.  
DLC, G1.C28

Permafrost research was begun in Canada in 1950, with the formation of a small Permafrost Section

within the Division of Building Research of the National Research Council of Canada. Since 1950, the Division's permafrost research has been concerned with permafrost distribution, construction techniques and building performance in permafrost areas, and the development of site selection methods and equipment. Since 1954, a major project has been the study of permafrost and engineering facilities at Inuvik, N.W.T., located in a zone of continuous permafrost. The construction of the Kelsey hydroelectric plant on the Nelson River in northern Manitoba provided an opportunity to study dike construction in 1958, in a discontinuous permafrost zone. In 1960, a study of permafrost distribution and foundation problems was initiated at Thompson, Manitoba, the site of a new mining and smelting development. A 25-min color film, "Building in the North," was produced for the Division in 1961. Other agencies involved in studying various aspects of permafrost in Canada are given. -- BLE

SIP 22200

551.594.5(\*2)

Ponomarev, E. A. and E. F. Vershinin

ON ULTRA-LOW-FREQUENCY RADIATION OF POLAR GLOW. (Ob ul'tranizkochastotnom izlucheni polarnykh sfir; Text in Russian). Geomagnetizm i aeronomiia, 3(3):485-495 incl. tables, graphs, diagrs., 1965. 17 refs.  
DLC, Slavic Div.

Results of ultra-low-frequency (ULF) observations at Tikai Bay, USSR, are presented. Data were recorded from the beginning of March to the middle of May 1962. An 820- to 14,000-cycle recorder was used with RC and LC filters and a 40-m wide dish antenna. The maximum signal level was set at a 15-min interval. The data indicates that an increase in the temperature of the polar-glow region causes the glow radiation to modulate, and to induce a cross-modulation which might account for the excitation of ULF waves in the upper atmosphere. A model was constructed to explain the generation and characteristics of UL radiation on the basis of the gas-discharge theory applied to the upper atmosphere around the polar cap. (ATD abstract)

SIP 22201

551.324:528.7(234.8)

Bruevich, P. N.

GROUND PHOTOGRAMMETRIC SURVEY OF THE POLAR URAL GLACIERS. (Nazemnaia stereofotogrammetricheskaiia sbemka lednikov Polarnogo Urala; Text in Russian). Issledovaniia lednikov i lednikovykh raionov, No. 3:229-235 incl. illus., tables, Aug. 1963.  
DLC, Slavic Div.

This paper describes a method of determining the dip angle of localities by aerial photography. A method

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is proposed to measure areas where the gradient does not exceed 20°. Fifteen glaciers, 20 km<sup>2</sup> in total area, were investigated during the field seasons of 1959 and 1960. Although the procedure was complicated by glaciation features (deep cirques, and large moraine formations at the end of glacier tongues), the modified method can be applied by geographers who have not had special photogrammetric training. (Author's abstract, modified)

SIP 22202

551.324.3(\*50)

Grosva'd, M. G.  
PRESENT-DAY GLACIERS IN THE MOUNTAINS OF NORTHEASTERN TUVA. (Sovremennye ledniki v gorakh severno-vostochnoi tuvy; Text in Russian). Issledovaniia lednikov i lednikovyykh raionov, No. 3: 48-55 incl. illus., table, diagr., map, Aug. 1963. 18 refs.  
DLC, Slavic Div.

Present-day glaciers were observed in the Khonchaar Mountains and in the region of the Topografov Peak. In the area of Eastern Sayan, glaciers occur as large as 11 km<sup>2</sup>. In the highlands, 38 glaciers were counted with a total area of at least 16 km<sup>2</sup>. The snow line is situated at a height of 24.0-2480 m, and the ends of the glaciers descend to 100-200 m and lower. The glaciers in the central portion of Eastern Sayan and in the neighboring Altay and Kodar glacier regions are diminishing. The greater accumulation of solid precipitation on the leeward side of the mountain ridges in Eastern Sayan is not a redistribution of fallen snow, but a result of the influence of orographic characteristics on the local atmospheric circulation. (RZh, Geofizika abstract, modified)

SIP 22203

551.322:541.63

Savel'ev, V. A. and N. D. Sokolov  
CALCULATION OF HYDROGEN BOND ELONGATION IN ICE DURING ISOTOPIC DISPLACEMENT. (Raschet udlineniia vodorodnoi svyazi pri izotopicheskom zameshchenii vo l'du; Text in Russian). Fizika tverdogo tela, 5(11):3273-3275 incl. graph, 1963. 11 refs.  
DLC, Slavic Div.

Hydrogen bond elongation during the change from light to heavy ice at various temperatures has been computed, based on a model of the hydrogen link previously proposed by Sokolov. In approximating the potential energy it was not possible to obtain an isotopic effect at any reasonable values for the parameters for an interatomic distance of 0...0 greater than for ice. This indicates that the lengthening of the 0...0 distance, observed in strong hydrogen links of 0.02-0.04 Å by other workers, is associated with a considerable change in form of the potential curve for the proton. (ATD abstract, modified)

SIP 22204

624.139:622.233

Kul'bitskiĭ, V. F.  
DRILL BIT FOR DRILLING HOLES IN FROZEN GROUND. (Bur dlia obrazovaniia kernov iz meralogo grunta; Text in Russian). Bŭll. Izobretenii, 40(15):116 incl. illus., Aug. 1963. DLC, T285.A34

A drill bit is described which has a tubular body with a capped reducer in the top part and bits in the lower part. For the purpose of increasing the efficiency in a single thrust, the outer surface of the drill bit is equipped with spiral blades along its entire length which bring the drilled soil to the surface. (ATD abstract)

SIP 22205

551.464.88

Bridge, Richard R.  
VACUUM-FREEZING AND VAPOR-COMPRESSION FOR DESALTING SEAWATER. Chemical Eng. 71 (13):114-116 incl. illus., diagr., June 22, 1964. DLC, TN1.M45

A 240,000-gal./day, 4-module plant at Eilat, Israel, is described. The process used is based on the principle that the boiling point of water varies directly with pressure, but its freezing point is essentially independent of pressure. Each module has a hydroconverter and a counterwasher. Initially, pressure in the hydroconverter is reduced below the vapor pressure of seawater at a specific temperature; some of the water flashes and, in so doing, absorbs its heat of vaporization from the seawater whose temperature consequently falls to a lower level with a corresponding new lower vapor pressure. As the operation continues, the vapor pressure and temperature decrease until the vaporization causes ice formation in the seawater, which boils at this point and freezes simultaneously. Because the heat absorbed by vaporization is 7-1/2 times the heat liberated by crystallization, each pound of vapor formed will produce (theoretically) 7-1/2 lb. of ice. Each phase of the purification process is diagrammed. -- BLE

SIP 22206

624.144:625.711(52)

Oshima, Tetsuo and Tetsuo Toma  
FREEZING ON ROAD SURFACES AND ITS COUNTERMEASURES. (Romen no toketsu to sono taisaku; Text in Japanese). Dōro Kensetsu (Road Construction), No. 184:24-30 incl. illus., tables, diagr., map, May 1963. DLC, Orientalia Div.

Traffic difficulties caused by icing on Suzuka (alt. 360 m) and Ausaka (alt. 160 m) Passes, from 1958 to 1962, in Shiga, Japan, are discussed. The average temperature is above -5°C, and snow depth seldom exceeds 20 cm. Road surface ice thickness varies

# CRREL BIBLIOGRAPHY

from 5 to 25 mm. In 1959 and 1960, sand was spread and a de-icing solution which contains 3%  $\text{CaCl}_2$  was applied. In 1961, "Dust Clean," a commercial de-icer which contains 5%  $\text{MgCl}_2$ , was used at a rate of 0.5-1.5  $\text{l/m}^2$ , with an effective de-icing time of 4-5 hr. The  $\text{MgCl}_2$  product was more effective than the  $\text{CaCl}_2$  product, and these solution-type devices could be more uniformly distributed than sand. Also, a sprinkling apparatus was set up every 400 m, and water carts and material spreaders were used. -- CST/BLE

SIP 22207

624.144.2:624.21(52)

Takahashi, Zen  
SNOW COVER SETTLING FORCE AND A TROUGH BRIDGE. (Sekisetsu no chinkōryoku to torafubashi; Text in Japanese). Tetsudō tsūshin (Railway Communication), 14(8):40-41 incl. illus., graph, diagrs., Aug. 1963. 1 ref.  
DLC, Orientalia Div.

In Jan. 1963, in Niigata, Japan, heavy snow caused damage to a cable-carrying steel truss. Subsequently, an I-beam span was designed to withstand the pressure of 4 m of snow. The settling force on a horizontal beam was measured as a function of snow weight and depth; e.g., the settling forces are 2 ton/m and 0.8 ton/m for snow 4 m and 2.5 m deep, respectively. Formulas are given for calculating moment, yield, and strain. -- CST/BLE

SIP 22208

624.144.55:537.31(52)

Aho, Toshihiro  
ON THE PREVENTION OF SHORT CIRCUITING OF ELECTRIC SNOW METER AND TRACK CIRCUITS. (Denki yūsetsuki no kido kairo rōei rogo ni tsuite; Text in Japanese). Denryoku to Tetsudō (Electric Lighting and Facilities in Railways), 14(4):10-13 incl. illus., tables, graph, diagrs., April 1964.  
DLC, Orientalia Div.

There are 3346 electric snow melters with a total capacity of 960 kw in 431 places in the Aomori section of the Electric Power System. Insulation failures occurred 31, 37, and 45 times in 1960, 1961, and 1962, respectively. A simulated insulation test was made by adjusting the phase relation of the power sources of the track relay and by using an automatic cutoff device. By this method, the insulation checking interval could be prolonged from 10 days to 1 month, and the minimum insulation requirement was lowered from 1 meg ohm to 0.5 meg ohm. -- CST/BLE

SIP 22209

624.144.55:621-78:537(52)

Kimura, Mitsuo  
DETECTION OF AN AUTOMATIC SIGNAL FAILURE CAUSED BY AN ELECTRIC SNOW MELTER. (Denki yūsetsuki no shōgai kenshutsu; Text in Japanese). Denryoku to Tetsudō (Electric Lighting and Facilities in Railways), 14(4):14-15 incl. graph, diagrs., April 1964.  
DLC, Orientalia Div.

The failure of an automatic railway signal was investigated, which was caused by the grounding of an electric snow melter at Sapporo, Hokkaido. The phase angle of the track relay was  $-97^\circ$  and the terminal voltage was 0.67-0.34. The track relay phase changed at 1 amp. of ground current, and a false stop signal appeared at 2 amp. An automatic indicator was devised for detecting ground current, and its external circuit is illustrated. -- CST/BLE

SIP 22210

629.47.024.8:551.326.65(52)

Nashimoto, Tomiju and Yoshinobu Maruwa  
ECHO SOUNDING OF FROZEN LAKE AND DETECTION OF POND-SMELT FROM SURFACE OF ICE (2). (Keppiyōko ni okeru hyōjō yorino suishin sekuryō to wakasagi tanchi no jikken (2); Text in Japanese with English summary). Gyosen kenkyū gihō (Technical Rept. of Fishing Boat), 18(2):1-5 incl. illus., table, graph, Aug. 1963. 2 refs.  
DLC, Orientalia Div.

This experiment was conducted Feb. 22-23, 1963, on Lake Haruna, Gunma Prefecture, using 28-kc low frequency ultrasonic waves. The transmission loss was almost the same as that of artificial ice (See SIP 21918). Since the loss of low frequency ultrasonic waves is less than that of mm waves, the former is more advantageous for echo sounding. Adequate soundings were obtained through the ice from the lake bottom even under adverse conditions. Accordingly, echo sounding from an ice surface may prove to be much easier than sounding from a water surface. Good echo traces of smelt were also obtained. (From authors' summary)

# CRREL BIBLIOGRAPHY

SIP 22211 528.47.024.8:551.326.85(52)

Hashimoto, Tomiju and Yoshinobu Maniwa  
ECHO SOUNDING OF FROZEN LAKE AND DETECTION OF POND-SMELT FROM SURFACE OF ICE. (Keppyocho ni okeru hyōjō yorino suishin sokuryō to wakasagi tanchi no jikken; Text in Japanese with English summary). Gyosen kenkyū jihō (Technical Rept. of Fishing Boat), 17(2):1-8 incl. illus., tables, graphs, diagrs., Aug. 1962.  
DLC, Orientalia Div.

See SIP 21918:

Hashimoto, Tomiju and others  
ECHO SOUNDING OF FROZEN LAKE FROM SURFACE OF ICE. Internatl. Hydrographic Rev., 40 (2):31-40, July 1963.  
DLC, VK798.R8

SIP 22212 551.578.46:624.024(52)

Kaneda, Keiichi  
AN INVESTIGATION OF THE SNOW COVER ON VARIOUS TYPES OF ROOFS. (Yane sekisetsu no chōsa; Text in Japanese with English summary). Fukui daigaku kōgakubu kenkyū hōkoku (Memoirs of the Faculty of Engineering, Fukui University), 10 (1-2):203-206 incl. illus., diagrs., March 1963.  
DLC, Orientalia Div.

Snow was investigated on various types of roofs including 2/10 and 3/10 sloping roofs, barrel vault (6.57 m diam. and 6.95 m curvature radius), dome (11.0 m diam. and 15.0 m curvature radius), and stupa in the Fukui city area during the winters of 1959-1961. The cracking, sliding, drifting, compacting and spreading of the snow are described and instructions are given for constructing roofs in heavy-snowfall regions. (Author's summary, modified)

SIP 22213 624.144.2:621.315.1:625.14(52)

Nagasaki, Hisatoshi  
SNOW DAMAGE AND COUNTERMEASURES ON JOETSU, SHINETSU, AND HOKURIKU LINES AT NIIGATA. (Jōshinetsusen hokurikusen setsugai to sono taisaku, niigata tetsukyoku yori; Text in Japanese). Denki tetsudō (Electric Railways), 17(12): 6-10 incl. illus., tables, diagrs., Dec. 1963.  
DLC, Orientalia Div.

Damages caused by snow to an electric railway at Niigata in Jan. 1963, are discussed. Snow 4-6 m deep with a specific weight of 0.6-0.8 exerted 3000 kg of pressure. Damages to the stay wires included a decrease in tension, and breaking or inclining of the stay-wire supports. Countermeasures included improving the design of the stay-wire systems, attaching heaters thereto, and decreasing the slope angle of the wire supports. Snow accumulation was

worse on the V-trusses where the height and width of the snow reached 1.8 m and caused truss bending, rupture, and short circuiting. Countermeasures included using tubular steel beam trusses and attaching heaters and movable brackets. Also discussed are snow accumulation on the railway cars, snow car patrolling during heavy snows, and damages to the transformer substation. -- CST/BLE

SIP 22214 624.144.2:621.315.1:625.14(52)

Kondō, Hiroshi  
SNOW DAMAGE AND COUNTERMEASURES ON JOETSU, SHINETSU, AND HOKURIKU LINES AT KANAZAWA. (Jōshinetsusen hokurikusen setsugai to taisaku kanazawa tetsukyoku yori; Text in Japanese). Denki tetsudō (Electric Railways), 17(12): 11-14 incl. illus., table, diagrs., Dec. 1963.  
DLC, Orientalia Div.

In Jan. 1963, the heaviest snowfall in 100 yr occurred in the Hokuriku area. As a result of precautions taken, a dependable source of electricity, and a heavy-duty traction engine, the railway operated without interruptions even during the snow. Damages occurred to the stay-wire equipment, the breaker-blade rest, and the circuit breaker compressor cylinder. Also damaged were (1) the ground connection of the transformer box (caused by snow accumulation on the high tension line); (2) the distribution line (disconnection); (3) the outdoor lamps; (4) the snow melting devices; and (5) the feeder-line poles. The countermeasures used included improving the design of the insulators, using extra snow-melting heaters, and reinforcing the distribution lines by using vinyl instead of cotton insulation. -- CST/BLE

SIP 22215 061.3:613/614(\*2)

World Health Organization, Geneva, Switzerland  
CONFERENCE ON MEDICINE AND PUBLIC HEALTH IN THE ARCTIC AND ANTARCTIC, GENEVA, AUG. 23-SEPT. 1, 1962. Tech. Rept. Series No. 253, 29p., 1963.  
DLC, RA8.A25

This report summarizes information presented at the conference which was intended to be a forum for the exchange of experiences on health problems in high latitudes, and for the pooling and analysis of progress so far made in coping with health problems in cold climates. The 6 sessions were entitled: epidemiology and special disease problems, the organization of health services in the Arctic, environmental health, mental health, physiology, and research needs (See SIP 22216). -- BLE

# CRREL BIBLIOGRAPHY

SIP 22216

061.3:613/614(\*2)

World Health Organization, Geneva, Switzerland  
**MEDICINE AND PUBLIC HEALTH IN THE ARCTIC AND ANTARCTIC.** Selected Papers from a Conference. Public Health Papers No. 18, 169p. incl. illus., tables, graphs, diagrs., 1963. 216 refs.  
 DLC, Unbound periodical

Nine papers are presented which were read at the Conference on Medicine and Public Health in the Arctic and Antarctic (the first of its kind to be sponsored by WHO), held in Geneva from Aug. 28 to Sept. 1, 1962. Thirty-two participants attended the Conference which covered a very broad field and provided an opportunity for the special medical needs of the polar regions to be considered from nearly all their many aspects. The general climatic and geophysical features of the Arctic and Antarctic were discussed, as well as the special characteristics of the people living there and the diseases from which they suffer. Particular attention was paid to acclimatization to cold, nutritional needs in cold climates, sanitation problems, and the psychological effects of isolation and prolonged darkness. For individual papers see SIP 22217-22225. -- BLE

SIP 22217

312:308:330.02(\*2)

Lantis, Margaret and Robert J. Anderson  
**SOME DEMOGRAPHIC, SOCIAL AND ECONOMIC FACTORS OF THE POLAR REGIONS.** p. 9-49 incl. tables. (In: Medicine and Public Health in the Arctic and Antarctic. Selected Papers from a Conference. World Health Organization, Public Health Papers No. 18, Geneva, 1963). 40 refs.  
 DLC, Unbound periodical

Characteristics of the regions beyond the temperate are described in relation to their significance to health services. Factors which might simplify the approach to health problems are racial and cultural affinities, the small number of languages, and the fact that only 3 national groups actually hold land in the Arctic and Antarctic. Also of importance are the so-called over-the-Pole air routes which have increased the importance of the polar areas, the incorporation of polar and sub-polar regions into national life, population changes, urbanization, and the increasing diversity of government assistance to outlying localities. Discussed also are growth and diversification of the economy which includes raw materials extraction, processing industries, handicrafts, international travel and transport, defense, and civilian research. No matter what quantities of food and other supplies are shipped into the Arctic and Antarctic, there are still difficulties in maintaining productive life. However, among the non-expendable resources of the polar regions, their location is one of the most important. The polar zones can be economical routes of communication and transportation between all continents, and they can supply needed raw and processed materials. -- BLE

SIP 22218

614.2(\*3)

Pesonen, Nillo  
**THE ORGANIZATION OF HEALTH SERVICES IN ARCTIC AREAS.** p. 50-68 incl. tables. (In: Medicine and Public Health in the Arctic and Antarctic. Selected Papers from a Conference. World Health Organization, Public Health Papers No. 18, Geneva, 1963). 7 refs.  
 DLC, Unbound periodical

The main features of the Arctic which affect public health services are climatic conditions, food and water supplies, and population density. Among the topics discussed are the age structure of the population of Arctic areas, public health service and personnel, local health committees, institutional medical care services, ambulance and mental health services, and research. In making improvements of public health services in polar areas, the following facts should be considered. (1) More health officers are required to keep standards as high as in other parts of the same countries. (2) The public health personnel should have wider qualifications than are required elsewhere. (3) Much more effort should be made to create better communications and improved means of transport. (4) Active participation of the population concerned in the organization of public health services is of utmost importance. (5) More funds are needed to cover the cost of public health services than are required for other parts of the same country. -- BLE

SIP 22219

614.2(\*37)

Henriksson, J.  
**HEALTH SERVICES IN THE ARCTIC REGIONS OF SWEDEN.** p. 69-80. (In: Medicine and Public Health in the Arctic and Antarctic. Selected Papers from a Conference. World Health Organization, Public Health Papers No. 18, Geneva, 1963).  
 DLC, Unbound periodical

Health and medical services are described for the northernmost part of Sweden, embracing Norrbotten County (pop. 260,000). Special mention is made of the diets of the inhabitants and the nomadic Lapps who live in the northwest part of the county. In the organization of health and medical services in this extensive and sparsely populated region the following factors must be considered: (1) distance, (2) roads and communications, (3) expenses, and (4) access to doctors and other nursing personnel. At present 1881 beds are available for institutional care and 566 are reserved for the chronically bedridden. For ambulatory care, the county is divided into 37 rural districts. Each is served by a health officer; in addition, 3 cities have a total of 6 specialist doctors. Patients are transported to the hospitals primarily by ambulance equipped with a stretcher. The first maternal and child welfare centers were opened in 1939. Since that time, the infant mortality rate has fallen from 67 per 1000 population to 17.11 per 1000.

# CORREL BIBLIOGRAPHY

For tuberculosis services, the county is divided into 5 central dispensary regions. Each center is served by a specialist with well qualified assistants. Dental centers set up for 94 appointments, but owing to a shortage of dentists only 65 of these are occupied at present. -- BLE

SIP 22220

613/614(\*3)

Colyar, A. B.  
SOME PROBLEMS OF DISEASE PREVENTION AND CONTROL IN SUBARCTIC AND ARCTIC AREAS. p. 81-96 incl. table. (In: Medicine and Public Health in the Arctic and Antarctic. Selected Papers from a Conference. World Health Organization, Public Health Papers No. 18, Geneva, 1963). 41 refs.  
DLC, Unbound periodical

The area considered in this discussion lies above 60°N where the average population density is less than 1 person/mi<sup>2</sup>. The major health problem among North American Indians and Eskimos is tuberculosis. In 1954, the enormity of the problem among Alaskan natives prompted the health authorities to embark on an intensive control program with emphasis on ambulatory chemotherapy. In 1960, 10% of the deaths in Alaska (excluding pneumonia of the new-born and tuberculosis) were caused by respiratory diseases. Diseases acquired by ingestion include acute intestinal infections, parasite infestations, and diseases caused by contaminated food. A survey revealed a prevalence of 1.7 to 33.6% infection with *Diphyllobothrium* sp. among 1035 Eskimos from 7 villages in western Alaska. A prevalence of 77% was reported at Port Harrison, Quebec, Canada. Comparable situations exist in parts of the Soviet Union and Finland. Other parasitic infections of importance are trichinosis, hydatid disease, brucellosis, and botulism. These diseases may be controlled by an improvement of food preparation and health conditions, and by preventing the spread of the parasites from animal hosts. Also among the leading causes of deaths in Alaska, Greenland, and other Arctic areas are accidents, alcoholism, suicide, and homicide. -- BLE

SIP 22221

613.2:613.48:612(\*2)

Rodahl, K.  
NUTRITIONAL REQUIREMENTS IN THE POLAR REGIONS. p. 97-115 incl. tables, graphs. (In: Medicine and Public Health in the Arctic and Antarctic. Selected Papers from a Conference. World Health Organization, Public Health Papers No. 18, Geneva, 1963). 57 refs.  
DLC, Unbound periodical

Current knowledge of polar nutrition is discussed including requirements of calories and specific nutrients, with particular emphasis on the effect of cold

upon such requirements. Data are given on (1) the amount of various types of insulation material needed for different metabolic rates at varying temperatures, (2) winter temperature distribution in a typical Arctic landscape profile, (3) caloric consumption and ratio of protein, fat, and carbohydrate consumption in different environments which include that of 15° latitude in the Antarctic, (4) the daily intake of essential nutrients by infantrymen and airmen in Alaska, and (5) the daily intake of essential nutrients in male Eskimos at 4 localities in Alaska. Eskimos, Indians, and whites living in the Arctic are not exposed to sufficient cold to necessitate the marked elevation of metabolism observed in rats at 5°C, therefore, there is no need for an increase in food or vitamin intake. Any general physiological changes resulting from cold exposure are small compared with the importance of such factors as habituation, experience, training, and fitness. -- BLE

SIP 22222

628(\*2)

Fair, Gordon M.  
SANITARY ENGINEERING IN POLAR REGIONS. p. 116-137 incl. illus., graphs, diagrams. (In: Medicine and Public Health in the Arctic and Antarctic. Selected Papers from a Conference. World Health Organization, Public Health Papers No. 18, Geneva, 1963). 11 refs.  
DLC, Unbound periodical

This paper examines climate, water resources, and the combination of factors such as soil and vegetation characteristic of the places that encircle the poles together with health and sanitary engineering problems. Emphasis is placed on water supply and distribution within polar communities, water purification, waste disposal, food sanitation and storage, insect and rodent control, and sanitary engineering requirements for exploration expeditions. -- BLE

SIP 22223

159.9:577.42(\*7)

Nelson, Paul D.  
HUMAN ADAPTATION TO ANTARCTIC STATION LIFE. p. 138-145 incl. table. (In: Medicine and Public Health in the Arctic and Antarctic. Selected Papers from a Conference. World Health Organization, Public Health Papers No. 18, Geneva, 1963). 8 refs.  
DLC, Unbound periodical

Psychological research efforts to date and environmental aspects of Antarctic station life are discussed. Of greatest importance in the consideration of human adaptation is the physical and emotional health of each individual. Aspects of the immediate environment such as work load and social restrictions are more critical for the development of emotional response variation than the fact that these men are isolated from the outside world. The third criterion



# CRRLE BIBLIOGRAPHY

of adaptation is the ability of the individual to adjust to other station members. It is pointed out that (1) adaptation is a dynamic process and not necessarily an end state, (2) the best adaptation correlate to date has been the summary evaluation of the Antarctic volunteer made by the psychiatrist and psychologist at the time of screening, (3) demographic characteristics such as age, education, and family background have been correlated with measures of adaptation, but with few consistent results, (4) personality data indicate that low dependence on others is positively correlated with over-all adaptation and similarly with low incidence of emotional change or medical complaint, and (5) certain aspects of group structure, such as the style of leadership, are important in the adaptation process, particularly in the study of group differences. -- BLE

SIP 22224

159, 9:577, 42(\*7)

Palma, G.  
PSYCHOLOGICAL ASPECTS OF TRANSIENT POPULATIONS IN ANTARCTICA. p. 146-158 incl. tables. (In: Medicine and Public Health in the Arctic and Antarctic. Selected Papers from a Conference. World Health Organization, Public Health Papers No. 18, Geneva, 1963). 42 refs.  
DLC, Unbound periodical

This article discusses (1) psychological adaptation to climatic conditions, isolation, and small community life, (2) methods of reducing stress: selection, preparation, recognition of achievement, and amenities, and (3) psychosomatic manifestations of Antarctic research personnel. The psychological log data consisted of (1) quarterly ratings of all personnel on an interpersonal check list, (2) weekly time samples of group interaction in verbatim records of group discussion, (3) quarterly assessment of "group prestige" of all members and the occurrence of cliques, (4) weekly summaries of interaction and adjustment of all group members, and (5) incidental records of case history data, symptoms and personal reactions of group members, reported in private conversations with the Medical Officer. The main psychological stress at an Antarctic base are problems of individual adjustment to the group, relative sameness of the milieu, and the absence of many accustomed sources of gratification, both sexual and gastronomic, and lack of variety of companionship. Selection for the Antarctic is usually by interview supplemented by psychological testing. Data indicate that the most important factor causing stress may be the monotony of the situation. It is also pointed out that there is a seasonal fluctuation in certain psycho-physical variables, most of which appear to be associated with the uniqueness of the environmental situation. -- BLE

SIP 22225

612-019:621-87(\*3)

Andersen, K. Lange  
PHYSICAL WORKING CAPACITY OF ARCTIC PEOPLE. p. 159-169 incl. tables, graphs. (In: Medicine and Public Health in the Arctic and Antarctic. Selected Papers from a Conference. World Health Organization, Public Health Papers No. 18, Geneva, 1963). 10 refs.  
DLC, Unbound periodical

The results are reported of physical fitness studies undertaken on nomadic Lapps, Eskimos, and Arctic Indians. Physical fitness was measured by determining oxygen uptake during hard muscular exercise on a bicycle ergometer of the mechanical braking type. The maximum work load lasted 3 to 4 min and the oxygen uptake was determined during the final 30 sec by collecting expired air into a rubber bag through a respiratory valve modified for heavy exercise. Air volume was measured by pumping the contents of the bag through a calibrated gasometer at a steady slow rate. Samples for oxygen and carbon dioxide were drawn directly from the bag. The physical characteristics of the subjects are given and data are presented which consider age and sex. Vital capacity is greatest among the Lapps and lowest among the Eskimos. These data are compared with those obtained from non-Arctic subjects. -- BLE

SIP 22226

551, 322:546, 212:536, 422/423

Delaney, L. J., R. W. Houston and L. C. Eagleton  
THE RATE OF VAPORIZATION OF WATER AND ICE. Chemical Eng. Sci. 19(2):105-114 incl. tables, graphs, diagr., Feb. 1964. 29 refs.  
DLC, TP1.C366

The condensation coefficient ( $\alpha$ ) for water near 0° C and 43° C was measured using the technique of vaporization into a closed system, and was found to be 0.042 and 0.027 respectively. The values of  $\alpha$  for water are compared with previous measurements at 15° C and 100° C. In the method used, the rate of vaporization is determined by measuring the rate of pressure rise in a known volume in the absence of condensation while simultaneously measuring the surface temperature of the evaporating pure liquid. The apparatus is diagrammed. The data indicate an exponential dependence of  $\alpha$  on temperature with an activation energy of -1520 cal/g mole. The experimental results give a temperature dependence for  $\alpha$  in agreement with recent work reported on solids but not clearly indicated by calculations according to the free angle ratio theory. The condensation coefficient is discussed in terms of the rate of escape of liquid water molecules, as estimated from the rate of rotation, compared to the rate of impingement of gaseous water molecules at the liquid surface. The values of  $\alpha$  calculated according to this model are 0.035 at 0° C and 0.034 at 100° C, compared to the experimental values of 0.042 near 0° C and 0.02 at 100° C.

# CRREL BIBLIOGRAPHY

The condensation coefficient for ice between -13° C and -2° C was found to be 0.0144, in contrast to values near unity measured below -40° C by others. (Authors' abstract, modified)

SIP 22227

551,591, 1:551,593:535, 7(\*2)

Kasten, Fritz  
VISUAL RANGE AND ALBEDO, ESPECIALLY IN THE POLAR REGIONS. 2. MEASUREMENTS OF METEOROLOGICAL-OPTICAL QUANTITIES IN CONNECTION WITH VISUAL RANGE, ESPECIALLY IN POLAR REGIONS. (Sichtweite und Albedo, insbesondere im Polargebiet, 2. Messungen von meteorologisch-optischen Größen im Zusammenhang mit der Sichtweite, insbesondere im Polargebiet; Text in German with French and English summaries). Beitr. Phys. Atmosphäre, 35(1/2):18-42 incl. tables, graphs, 1962. 12 refs.  
DLC, QC851.B4

Measurements were made of quantities occurring in the theory of visual range, e.g., ground albedo, luminance distribution of sky and snow surface, the visual extinction coefficient of the air, and contrasts of artificial sight markers of different albedos at different distances from the observer. For comparison, measurements were also made of ground albedo and radiance distribution of sky and snow surface in the near infrared (IR) spectral range. With one exception, the photometers and albedometers used were recently designed. The measurements were made at Mainz, at Lake Constance, and in the interior and on the border of the North Greenland Ice Plateau. The Greenland measurements were of special interest with regard to polar whiteout. The IR-albedo of the snow surface seemed to increase when the water content of the air increased. The IR-radiance distribution of sky and snow surface shows a break at the horizon during whiteout; at this time, the horizon can be "seen" in the near-infrared spectral range as opposed to the visible one. (See SIP 20109 for Part I) (From author's summary)

SIP 22228

(100)082,2:(211)613,11

Smith, Robert E. (ed.)  
PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON COLD ACCLIMATION. Federation Proceedings, Part II, Supplement No. 5, 19(4), 165p. incl. illus., tables, graphs, diagrs., map, 1960. Refs. [Also: Simposio Internacional de Acclimatacion al Frio, Inst. Antártico Argentino, Publ. No. 9, 1962.]  
DLC, QH301.F37; DLC, GPRR

This symposium was organized under the joint sponsorship of the Instituto Antártico Argentino and the Federation of American Societies for Experimental Biology, and held Aug. 5-7, 1959, in Buenos Aires,

Argentina. The 6 sections are entitled: Man in a Cold Environment, Thermogenesis in the Acclimated Animal, Neurohumoral Response Patterns and Endocrine Functions, Intermediary Metabolism, Cellular and Subcellular Energetics, and General Discussion and Summary of the Symposium. The agenda centered around the response patterns of man and animals to continued exposure to low environmental temperatures. An attempt is made to achieve a systematic coverage of adaptive behavior (particularly heat production) of the intact organism in terms of the known regulatory mechanisms operating variously in organ systems at cell and subcellular levels. --BLE

SIP 22229

612,592(\*2)

Edholm, O. G.  
POLAR PHYSIOLOGY. p. 3-8 incl. table, map. (In: Proceedings of the International Symposium on Cold Acclimation, Buenos Aires, Aug. 5-7, 1959. Robert E. Smith, Ed., Federation Proceedings, Part II, Supplement No. 5, 19(4) Dec. 1960. 18 refs.  
DLC, QH301.F37

Acclimatization of man to cold was studied at Amundsen-Scott, Halley Bay, Horseshoe Island, Scott, and Shackleton Stations. Changes observed during acclimatization include (1) a seasonal increase in body weight and subcutaneous fat thickness during winter, probably due to social rather than environmental factors; (2) clothing records, which show that less clothing is worn over the extremities after some months of exposure. Coupled with this is the evidence that sleep in severe cold gradually improves. The wearing of fewer clothes, and the ability to sleep in the cold, can be due to a changed response to sensory stimuli, i.e., the subject learns to ignore the sensory information from his skin telling him he is cold; (3) local adaptation of hands and possibly feet; (4) increased food intake and energy expenditure in the cold. The most valuable aspects of polar physiology are not concerned with cold at all. Diurnal rhythms, sleep patterns, changes in the BMR, body weight and skin-fold thickness, and other phenomena can be studied more effectively in the Antarctic than in temperate regions. --JFS

SIP 22230

551,345, 2:551,79(\*531,5)

Belorusova, Zh. M.  
PERMAFROST ON TAZ PENINSULA AND THE HISTORY OF ITS DEVELOPMENT IN QUATERNARY TIME. (Mnogoletniyá merslota na Tazovskom Poluostrove i istoriya ee razvitiya v chetvertichnoe vremya; Text in Russian with English summary). Vestnik Leningradskogo Universiteta, No. 12:79-89 incl. map, 1963. 14 refs.  
DLC, AS262.L463

The permafrost on Taz Peninsula was formed under the colder climatic conditions of the epoch of continental glaciation. The best conditions for freezing the 400-m-thick bedrock existed in Zirjansky time when the peninsula was without seaweed and permafrost. However, the appearance of permafrost during the lower-Quaternary glaciation is also to be considered. During this period, most of the bedrock was beginning to freeze. During the mid-Quaternary (especially at the maximum of the Jamalsky transgression) the bedrock was completely or partly thawed up to a depth of 300-320 m. The texture of the upper part of the bedrock, unfrozen for many years, is indicative of changes in the frozen regime during the Holocene epoch. Wherever the thawing of the bedrock was at its minimum in the climatic optimum, thick frozen layers were formed by the next drop in temperature. (From author's summary)

SIP 22231

613/614(+3)

Kandror, I. S.  
THE FUNCTIONAL CONDITION OF THE ORGANISM DURING ACCLIMATIZATION IN THE ARCTIC.  
(Funksional'noe sostoiānie organizma v proĭesse akklimatizatsii v Arktike; Text in Russian). Problemy Severa, Vyp. 6:34-48 incl. graphs, 1962. 28 refs.  
DLC, GB395.P7

Data are presented from studies in the Arctic of shifts in physical heat regulation of acclimatized persons, seasonal fluctuations of lung ventilation and frequency and depth of breathing during polar day and polar night periods, the mean blood pressure of people aged 20 to 29 yrs shortly after moving to the Arctic from a temperate climate, seasonal frequency fluctuations for the electrical resistance of the skin, and the weight of children (up to 3 yrs of age) born in the Arctic. The data indicate that with greater expenditure of energy, more vitamins and proteins are needed in the diet, more clothing is necessary to provide adequate warmth, housing should have adequate space for living and storage and a forced air ventilation system, houses and public buildings should be built with more heat and wind protection and with maximum use of direct sun light, and lighting with ultraviolet components should be more widely used. During polar nights, both mental and physical work should be performed with more frequent breaks. Physical activities and sports should be encouraged as well as more frequent vacations. More medical facilities should be provided and medical standards should be set up to eliminate persons who are particularly predisposed to the unfavorable effects of weather and life in the Arctic. (ATD abstract, modified)

SIP 22232

613/614(+3)

Arnol'di, I. A.  
HYGENIC ACCLIMATIZATION PROBLEMS OF THE POPULATION IN THE FAR NORTH. (Gigienicheskie voprosy akklimatizatsii naseleniia v zapol'ar'e; Text in Russian). Problemy Severa, Vyp. 6:49-58, 1962.  
DLC, GB395.P7

Factors affecting acclimatization are discussed on the basis of earlier (1946-1957) studies in the far north. It is emphasized that acclimatization is not a stable or uniform process for all latitudes of the far north, and that optimal conditions for acclimatization to extreme cold are gradual adjustment (2°-3° at a time) to the effects of microclimatic factors. Those who move directly from southern climates to the north have the most difficulty acclimatizing, and those who come from northern climates have the least difficulty. Adaptive processes fluctuate with the seasons and unfavorable physiological shifts occur during the polar nights, but during polar days the shifts are very favorable. To compensate for water deficiencies, the water should be fluorinated and iodized salt should be used. It is strongly recommended that mine workers have warmer clothing, better ventilation, heating systems, hot food and drink, noise reduction, and better lighting. Acclimatization can be accelerated and regulated by conscious effort, optimal sanitary-hygienic conditions, improved housing, vitamin and mineral enriched diets, warmer clothing, more ultraviolet radiation, well organized work and recreation schedules, and eventually by controlling weather itself. (ATD abstract, modified)

SIP 22233

551.345.1:551.333

Mackay, J. R. and W. H. Mathews  
THE ROLE OF PERMAFROST IN ICE-THRUSTING.  
J. Geology, 72(3):378-380, May 1964. 10 refs.  
DLC, QE1.J8

Contrary to Rutten (SIP 18339) who states that "the genesis of ice-pushed ridges depends on the formation of a thick permafrost soil in front of the advancing ice sheet," with thick permafrost developing in waterlogged ponded areas, the ponding of a large body of water degrades the upper permafrost surface in an area of continuous permafrost, while it inhibits the growth of permafrost in an area where low temperatures would otherwise initially develop permafrost. Therefore, any large ponded bodies of water, commensurate with the sizes of the ice-pushed ridges, which may be 20 or 30 mi across, and tens of hundreds of feet deep, would have had no permafrost beneath them (unless it was degrading relic permafrost) except for the near-shore areas. If it is argued that permafrost formed initially beneath the advancing ice, then both the basal ice temperatures and the time span must have been sufficient to develop permafrost 80-150 m thick. It does not seem necessary to have a high content of interstitial ice in order to have sufficient rigidity to permit deformation. Theoretically, the development of per-

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mafrost can favor ice-thrusting and localize thrust planes, and the movement of ice up an opposing slope may also assist ice-thrusting; but this movement and the presence of permafrost are not necessary conditions. -- BLE

SIP 22234

551.46.085:536.2(\*764)

Gilmour, A. E.  
HYDROLOGICAL HEAT AND MASS TRANSPORT  
ACROSS THE BOUNDARY OF THE ICE SHELF IN  
McMURDO SOUND, ANTARCTICA. New Zealand J.  
Geol. and Geophys. 6(3):402-422 incl. tables, graphs,  
map, June 1963. 10 refs.  
DLC, QE1.N55

Current measurements and aerial temperature and salinity observations made in McMurdo Sound during the 1960-1961 summer are presented. Most of the current measurements were at 2 sites close to Cape Armitage, the southern extremity of Ross Island; these show a residual current of about half a knot flowing towards the Ross Ice Shelf from McMurdo Sound, the fastest currents being close to the sea bottom. Harmonic constants were calculated for the tidal current components. The data are used as a basis for estimating the annual heat and mass transport associated with the southward flow of sea water across a boundary at latitude 77° 50'S. Thermal energy amounting to  $7.4 \times 10^{17}$  cal, available for melting ice, is estimated to be transported across the boundary during the first quarter of each year, the transport at other times being small. A volume of  $2.7 \times 10^{13}$  m<sup>3</sup>/yr is transported annually across the boundary, with little seasonal variation in the transport rate. (Author's abstract)

groups during later days in the cold; however, the data were too variable to demonstrate a close relationship between depressed core temperature and decreased heat production. It is concluded that marked restriction of calories is associated with depressed core temperatures during prolonged cold exposure, due in part to the absence of specific dynamic action. (Authors' abstract)

SIP 22236

612.592

Hart, J. S. and others  
THERMAL AND METABOLIC RESPONSES OF  
COASTAL ESKIMOS DURING A COLD NIGHT. J.  
Appl. Physiol. 17(6):953-960, Nov. 1962.  
DLC, QP1.J75

Metabolic and thermal studies were conducted at night at Pangnirtung, Northwest Territories, on ten Eskimo hunters from Cumberland Sound, Baffin Island, and on three white controls, to compare their reactions to cold ( $5 \pm 1^\circ\text{C}$ ) with that of other racial groups. Cumberland Sound Eskimos maintained a resting metabolism that was elevated, according to DuBois standards, during sleep on warm nights. This elevation was not found in hospitalized men who had been living for an average of 6 months in Edmonton, Alberta. During exposure to moderate cold, the Cumberland Sound Eskimos and white controls had an elevated metabolism, shivering, and a disturbed sleep. Peripheral temperatures were maintained at a higher level in Eskimos than in whites. Because of the absence of marked physiological differences between Eskimos and whites, it is concluded that the principal adaptation of these Eskimos to their climate is technological. (Authors' abstract)

SIP 22235

612.592

Iampietro, P. F. and D. E. Bass  
HEAT EXCHANGES OF MEN DURING CALORIC RESTRICTION IN THE COLD. J. Appl. Physiol. 17(6):  
947-949, Nov. 1962.  
DLC, QP1.J72

The ability of men to maintain thermal balance during continuous cold exposure (14 days at  $15.6^\circ\text{C}$ , sedentary while nude) was assessed under four regimens of caloric intake: (a) adequate, 2,800 kcal/day; (b) moderate restriction, i.e., sufficient to maintain weight in a warm environment but without the added calories to support shivering, 2,600 kcal/day; (c) marked restriction, 600 kcal/day; and (d) complete starvation, 0 kcal/day. Respective weight losses for b, c, and d were 1.8, 8.2, and 12.2% body weight. With 600 and 0 kcal/day there was an impaired ability to maintain rectal temperature; under these conditions the men exhibited rectal temperatures  $0.7^\circ\text{C}$  lower than when they were on adequate or nearly-adequate caloric intake. The men on complete starvation had the lowest heat production of all

SIP 22237

551.32(\*75)

Lorius, Claude  
ADELIE LAND. SUMMER SEASON 1961-1962.  
GLACIOLOGY. (Terre Adélie. Campagne d'été  
1961-1962; Text in French with English summary).  
Expeditions Polaires Françaises (Missions Paul-  
Emile Victor), No. 241, 108p. incl. illus., tables,  
graphs, diagrs., maps, 1963. 18 refs.  
DLC

Positions and elevations of 38 markers were determined along a line 35 km long and up to 800 m above sea level along Adélie Coast. Borehole measurements of mean annual temperature distribution show a near-linear relationship between altitude and temperature. Snow accumulation, as measured by markers and stratigraphic studies of pits and cores, varied from 0 to +30 cm (water equivalent). Inconsistent accumulation results may be eliminated through stable and radioactive isotope methods. Electrical measurements of liquid samples from snow, firn, and ice show that resistivity seems to increase with distance from the coast. Fluctuations

of samples from firn strata may be due to a seasonal cycle. Resistivity measurements on precipitation from Dumont d'Urville Station reach a maximum value of 300,000 ohm-cm. Retreat of the Astrolabe Glacier is continuing, as shown by the emergence of rock outcrops and hydrographic soundings near the glacier front. The glacier is shown in a photograph and a detailed map shows the flow pattern, form lines and shading of fractured areas. (From author's summary)

SIP 22238

551.32:91:(73)''1958-1961'':(\*7)

Crary, A. P.

RESULTS OF UNITED STATES TRAVERSES IN EAST ANTARCTICA, 1958-1961. IGY Glaciological Rept. No. 7, IGY World Data Center A: Glaciology. 144p. incl. illus., tables, graphs, diagrs., maps, appendixes, Dec. 1963. 48 refs.  
DLC

This report summarizes and reviews most of the observations that were made on the plateau area west of the Ross Sea and Ross Ice Shelf and east of about long. 120° E by three U.S. traverses totaling over 4000 km. Elevations deduced from multiple altimetry methods show a general rise to the south and west of about 5 to 10 minutes of arc, the ice immediately west of the Transantarctic Mountains being at about 2000 m above sea level. From the elevation contours, it appears that the ice flow converges in the regions of the Byrd, Nimrod, and Scott Glaciers, and diverges in the area of the McMurdo Sound volcanics and dry valleys. A high anomalous area between the South Pole and the Ross Ice Shelf rises to a value 300 m higher than the South Pole surface, and presumably deflects the ice flow in the vicinity of the pole to the Weddell Sea. Ice thicknesses were determined by reflection and refraction seismology and gravity measurements were used to obtain the intermediate ice thickness trends between seismic values. Snow accumulation on the plateau is low, ranging from 16 to 2 g/cm<sup>2</sup>/yr as deduced from pit studies and stake networks. The appendixes contain (1) station locations, elevations, gravity and magnetic data, (2) ice core density values, Victoria Land Traverse No. 1, and McMurdo-Pole Traverse, (3) velocity determinations, P and S waves, and (4) seismic records from traverse sites. (Author's abstract, modified)

SIP 22239

551.578.7:551.501.81

Atlas, David and Raymond Wexler  
BACK-SCATTER BY OBLATE ICE SPHEROIDS.  
J. Atmospheric Sciences, 20(1):48-61 incl. tables, graphs, Jan. 1963.  
DLC, QC851.A23

Back-scatter measurements are presented for a set of oblate ice spheroids and a set of ice-simulating dielectric spheroids at 3.2- and 9.7-cm wave lengths as a function of aspect and polarization. For the ice particles, a bistatic system with transmitting and receiving horns mounted adjacent to one another was used. A monostatic system was used for the stycast particles. Prior to each target measurement, the signal level corresponding to that of a standard metal sphere was recorded to provide an absolute scale for target cross section. The targets were placed on a polyfoam column split at the top to provide a firm hold. The ice spheroids were frozen in hollow oblate plasticene molds. The data show that oblate stycast spheroids with very small electrical size scatter nearly as predicted by the Gans theory. The results from ice are quite comparable to those from stycast. It is concluded that (1) hailstone cross sections are equal to or less than those of equivolume spheres, (2) oblate stones may scatter better than equivolume spheres, (3) shape effects are sensitive to the stone's electrical size, (4) the cross sections on vertical polarization of electrically large stones are fairly sensitive to orientation, (5) the cancellation ratio produced by switching from linear to circular polarization depends upon the difference in hailstone cross sections or a orthogonal linear polarizations, and (6) for electrically small particles, the Gans theory predicts greater polarization effects for water-coated ice spheroids than for dry ice. -- BLE

SIP 22240

5.001.5:(\*7)

Laclavère, Georges

A FROZEN CONTINENT OF MANY PARADOXES.  
UNESCO Courier, No. 1:4-8 incl. illus., Jan. 1962.  
DLC, GPRR

This is a general discussion of Antarctica, citing physical features and figures. IGY data show an annual over-all increase of ice equivalent to 3 mm of water, even though certain observations show coastal ice to be receding. One of the most important contributions of the IGY was done by the network of 57 meteorological stations in the Southern Hemisphere which attempted to determine the role of the Antarctic on the general atmospheric circulation. The only economic value of Antarctica is in whaling and the potentially-rich food value of the southern oceans. Peaceful coexistence of 12 nations active in the Antarctic has led to the Antarctic Treaty, which guarantees freedom of scientific research for 30 yr and allows SCAR, a non-governmental organization, freedom to plan the research. It is a paradox that such a hostile continent should have done the most to promote peace. -- JFS

SIP 22241

551, 322:536, 241:539, 42

Gold, L. W.  
**CRACK FORMATION IN ICE PLATES BY THERMAL SHOCK.** Can. J. Phys. 41(10):1712-1728 incl. illus., tables, graphs, diagr., Oct. 1963. 21 refs. Also issued as: Natl. Res. Council Rept. No. 7548. DLC, QC1.N332

Cracks were formed in the surface of smooth ice blocks by bringing them into contact with a second colder ice block. The temperature change within each block and the associated thermal stress were calculated. The ultimate strength of a smooth ice surface was found to be between 30 and 40 kg/cm<sup>2</sup>. The surface temperature shock necessary to produce this stress was about 6° C. There was a marked preference for the cracks to form parallel to the basal and prismatic planes. Maximum depth of crack penetration was obtained with ice blocks made up of only 1 or 2 crystals with their C axis perpendicular to the surface. The minimum observed value for the strain energy release rate at crack arrest was between 150 and 200 ergs/cm<sup>2</sup> for each cm<sup>2</sup> of new crack surface, indicating that for the crystallographic orientation and stress distribution of those experiments, there was relatively little plastic deformation at the crack tip. The associated crack edge stress intensity factor was between  $3.0 \times 10^6$  and  $3.5 \times 10^6$  dynes/cm<sup>3/2</sup>. It was observed that the calculated strain energy release rates for these cases may exceed the true values because of reduction in the stress between the surface and the bottom of the crack prior to crack arrest. (Author's abstract, modified)

SIP 22242

551, 463, 288:551, 467(\*464)

Milne, A. R. and J. H. Canton  
**AMBIENT NOISE UNDER ARCTIC-SEA ICE.** J. Acoust. Soc. Amer. 36(5):855-863 incl. illus., graphs, maps, May 1964. 6 refs. DLC, QC221.A4

Underwater ambient-noise spectra and amplitude distributions are described for data acquired during field experiments made in the spring, late summer, and winter within the Canadian Arctic Archipelago. Noise between 0.2 cps and 20 kc/sec was recorded during a 30-hr period. Since the ice was shorefast during the spring and winter, a bottom-mounted hydrophone was used. The water depth was 1580 ft. The hydrophone was a barium titanate cylinder (Channel Industries Ltd., Type B 17 CR.), 8 in. in diam., with a sensitivity of -65 dB re 1V/ $\mu$ bar. Recordings were made for 5 min every hour, using battery power. The ambient noise was generally impulsive and at times highly non-Gaussian. The significant noise was the result of mechanical activity associated with the ice cover. For shorefast spring and winter ice, surface cracks as a result of thermal stresses were important; for late summer ice, relative motion of the floes was important. -- BLE

SIP 22243

551, 463, 288:551, 467

Green, Robert E., Jr.  
**REFLECTION OF AN UNDERWATER SHOCK WAVE FROM OVERLYING ICE LAYER.** J. Acoust. Soc. Amer. 36(3):603 incl. diagr., March 1964. 5 refs. DLC, QC221.A4

Theoretical consideration is given to the problem of reflection of a shock wave in water from an overlying ice layer. Expressions are derived for the sound field in the ice, in the water, and in the bottom. The Pekeris model is used where all three media are treated as liquids with their respective densities and velocities of sound propagation. (Author's abstract, modified)

SIP 22244

551, 463, 24:551, 467(\*3)

Brown, J. R.  
**REVERBERATION UNDER ARCTIC ICE.** J. Acoust. Soc. Amer. 36(3):601-603 incl. graphs, map, March 1964. 4 refs. DLC, QC221.A4

During Sept. 1963, under-ice reverberation recordings were obtained in the octave bands 1.28-2.56 and 5.12-10.24 kc/sec. The data were obtained with the aid of Canadian Industries Ltd. "Seismoraps" as sound sources and an Atlantic Research Corp. BC-50 hydrophone as a receiver. The detonators were fired electrically at a depth 100 ft below the under surface of the ice. The hydrophone depth was 90 ft. The horizontal separation between the sources and detector was 8 ft. The maximum grazing angle from which reverberations were received prior to the arrival of the bottom signal was 7°. Scattering strengths were calculated by the Chapman and Harris method. The striking similarity between the present data and those of Chapman and Harris suggests that the under surface of the summer polar ice encountered was as effective a scatterer as was the sea surface encountered by Chapman and Harris when the wind velocity was 30 knots. The data also indicate a slope different from Marsh's theoretical curve and, over a wide range of grazing angles, a scattering strength lower than the Mellon and Marsh value. -- BLE

SIP 22245

551, 594, 5(\*3)

Fel'dshteyn, A. L. and N. F. Shevina  
**RESULTS OF VISUAL OBSERVATION OF AURORA IN THE NORTHERN HEMISPHERE DURING THE EGY.** (Nekotorye rezul'taty visual'nykh nabl'udeni' za pol'arnymi svishcheniyami v severnom polusharii v period MGG-MGS; Text in Russian). Geomagnetizm i Aeronomiya, 3(4):679-692 incl. tables, graphs, maps, 1963. 19 refs. DLC, QC811.G38

Results are presented on visual and photographic auroral observations obtained at 620 polar stations in the Soviet Union during the IGY. The studies were limited to latitudes 42° to 68° N, and an attempt is made to determine the southern boundary of the auroral phenomena observed at the zenith in European and North American territories. A good agreement exists between visual and photographic observations in describing the distribution of aurora; especially in geomagnetic latitudes 63° - 65° N. Increasing geomagnetic disturbances displace the southern boundaries of the aurora closer to the equator. During midnight hours, the southern boundary shows a maximum displacement away from the pole. During morning and evening hours, maximum displacement occurs towards the pole. Magnetic storms decrease proportionately the distance between the earth and the internal boundary of the charged-particle radiation belt. (ATD abstract, modified)

SIP 22246 551.509.67.551.501.81(\*50)

Volynets, L. M. and others  
RADAR OBSERVATIONS AS A METHOD OF INVESTIGATING EFFECTS IN SUPERCOOLED STRATUS CLOUDS. (Radiolokatsionnye nabljudeniya kak metod issledovaniya vozdeystviya na pereokhlazhdeniye sloistye oblaka; Text in Russian). Meteorologiya i Gidrologiya, No. 10:3-9 incl. illus., graphs, diagr., Oct. 1963. 2 refs.  
DLC, QC851.M27

Stratus clouds that do not yield precipitation usually form during the cold months of the year and mostly at low altitudes. Temperature inversion is common, and, with freezing temperatures generally prevailing at the earth's surface, snow is the expected type of precipitation. Radar stations with potentials higher than normal were able to detect solid precipitation even when very light at distances up to 70-80 km. Granules of solid CO<sub>2</sub> were scattered from an airplane flying on a course about 20 km long normal to the wind direction and at cloud-top height. Pictures were taken to determine the area over which precipitation occurred. Falling snow at a rate less than 0.1 mm/hr was detected at distances up to 20 km. Readings were taken each 5 min in order to plot the precipitation zone at various heights. The belts of artificial precipitation were not uniform along their length, but pinched and swelled. This may have been caused by seeding irregularities or variation in atmospheric turbulence. The data indicate that the lower boundary of the precipitation zone descends more rapidly than the upper (1 m/sec as opposed to 0.5 m/sec in this experiment). This is in agreement with the view that ice particles are larger in the lower part of a cloud than in the upper. (ATD abstract, modified)

SIP 22247 551.524.78:551.509.318:527(\*3)

Maksimova, O. T.  
SYNOPTIC CONDITIONS FOR THE FORMATION OF LARGE TEMPERATURE ANOMALIES IN THE ARCTIC DURING THE AUTUMN SEASON. (Sinopticheskie usloviya formirovaniya krupnykh anomalii temperatury v Arktike v osenniy period. Text in Russian). Problemy Arktiki i Antarkтики, Vyp. 12:47-53 incl. tables, maps, 1963. 3 refs.  
DLC, G575.L422

A study was conducted to determine the conditions for the formation of large autumnal temperature anomalies in the Northern Hemisphere, especially in the Arctic, and to determine Arctic navigation conditions. The geographic distribution of these anomalies was studied for the month of Oct., the key month in determining autumn weather. Charts of the Northern Hemisphere were consulted which show the average monthly air temperature and pressure distribution from 1891 to 1958, 500-mb measurements (1940-1958), and Vangengeym's catalogs of air circulation and pressure over the Arctic. Forecasting of an anomalously warm or cold autumn was found to depend to a great extent on accurate forecasting of the prevailing form of atmospheric circulation, a feature routinely investigated by the weather services. Use of these services in conjunction with temperature anomaly studies can provide important information to those concerned with Arctic navigation. (ATD abstract, modified)

SIP 22248 061.3:551.509.3(\*3)

Kirillov, A. A. and E. G. Nikiforov  
CONFERENCE OF ARCTIC OBSERVATORY SCIENTISTS. (Konferentsiya nauchnykh rabotnikov Arkticheskikh observatoriy; Text in Russian). Problemy Arktiki i Antarkтики, Vyp. 12:139-141, 1963.  
DLC, G575.L422

The first scientific conference on Arctic observatory research, held in Tiksi, May 7-9, 1962, was organized by the Arctic and Antarctic Institute and the Tiksi Observatory. The 15 papers presented at the conference (four by members of the Institute and eleven by scientists at the Institute's observatories in Tiksi, Pevek, and Dikson) dealt mainly with problems of long-range hydrological, meteorological, and ice forecasting in the Arctic. The immediate projects of the Institute include the development of reliable forecasting techniques (especially numerical forecasting methods utilizing the "Ural-2" high-speed electronic computer), weather control, and climate modification in some climatic regions of the earth and in the Arctic in particular. In a paper entitled "Current Status and Ways of Perfecting Long-range Weather-forecasting Techniques in the Arctic," it is emphasized that the causes of weather changes in the Arctic can be determined only if synoptic processes are studied on a global scale. Other papers discuss the problem of extending long-range forecasts from 4-6 months to 8-10 months,

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methods to secure reliable prediction of diurnal wind variation 3-4 days in advance, and problems of ultra-long-range forecasting (10-12 yr). Actual and projected methods of predicting ice (including numerical methods) along the North Sea Route, short-range ice-regime prediction, the thermal balance of ice, and the albedo and radiation balance of the sea were discussed. (ATD abstract, modified)

SIP 22249

551.542.1:551.324.435(+50)

Tushinskii, G. K. and N. M. Malinovskii  
THE POSITION OF "LEVEL 365" OVER THE TERRITORY OF THE USSR AND THE RELATIONSHIP OF THIS LEVEL TO GLACIATION. (Polozhenie "urovnia 365" nad territoriei SSSR i sbiaz' etogo urovnia s oledeneniem; Text in Russian). Inform. sbornik o rabotakh po Mezhdunarod. Geofiz. Godu, No. 9:5-9 incl. table, 1962. 1 ref.  
DLC, Slavic Div.

The gradients and absolute height at which the snow cover can remain 365 days/yr have been determined for the majority of the regions of present glaciation. In the southern regions, the duration of a stable snow cover increases by 8-10 days for every 100-m rise, whereas in the polar regions of the USSR this gradient is equal to 20-16 days for every 100-m rise, and decreases by 5-6 days in the eastern regions of the USSR. The gradient decreases from 16 to 11 days per 100-m rise along the Novaya Zemlya-Southern Urals meridian. It decreases from 17 to 8 days for every 100 m rise along the Severnaya Zemlya-Verkhoyansk Range Transbaikalia meridian. Calculations were made of the differences in the heights of the actual snow lines in various glaciated regions of the USSR, and of the heights of "level 365." The differences were negative for all of the regions (except that of Franz Josef Land, where the difference was equal to zero). The height of the "365" level ranged from 300 m (Franz Josef Land) to 5000 m on Pamir. The smaller the number of days with a stable snow cover per year, the greater was the concentration of snow necessary for the existence of glaciers. (ATD abstract, modified)

SIP 22250

551.578.7(+428)

Douglas, Richard H. and Walter Hirschfeld  
STUDIES OF ALBERTA HAILSTORMS, 1957. Sci. Rept. MW-27, "Stormy Weather" Res. Group, MacDonald Physics Lab., McGill Univ., 79p. incl. illus., tables, graphs, diagrs., map, May 1958. 5 refs.  
DLC, Tech. Rept. Collection

This project was planned as a study of the basic physics of the hailstorm. The hail reporting network included 15,000 mi<sup>2</sup> of the most notorious hail country in North America. The radar used in this re-

search is described, and the principles and techniques for its utilization are discussed. The data indicate that sustained hail came from storms whose radar-echo heights were steady in the vicinity of 30,000 ft. With echo heights less than 30,000 ft, an upsurge of the echo top was often followed by hail. This may support the concept that strong updrafts are required for hail formation. An updraft speed of 2 m/sec - the fall speed of rain - may be critical. On the basis of an examination of 83 storms occurring 14 days in July and Aug., it was found that the probability of hail falling from a given storm was an increasing function of storm height. Storm height itself, however, is not the cause of hail; it may be merely a readily measured concomitant of hail, with the primary cause being the unmeasurable updraft.  
-- BLE

SIP 22251

551.578.7(420)

Imperial College of Science and Technology (London)  
FINAL REPORT: RESEARCH ON CHARACTERISTICS AND EFFECTS OF SEVERE STORMS. Contract No. AF 61(052)-254, Dept. Meteorology, Imperial College of Sci. and Tech., London, 12p., May 1964. 34 refs.  
DLC, Tech. Rept. Collection

The results are outlined of cumulonimbus cloud studies which were conducted during the 5 yr commencing April 1959. A cold-cloud wind tunnel was used to establish the conditions governing the density and structure of rime ice accreted from supercooled and mixed clouds, and to determine the air drag of artificial hailstones. Radar (calibrated by balloon-borne standard metal spheres) was used to determine the free-fall speed of artificial hailstones. The life history was recorded of the three-dimensional radar echoes from cumulonimbus using 5 radars of 3 different wave lengths by observing the distribution of echo intensity. A 2000-observer network was established in central England to record the occurrence and type of rain, hail, lightning, squalls, and other parameters associated with thunderstorms in a 5 x 10<sup>4</sup>-km<sup>2</sup> area around the radar base. Time errors were no greater than 1 to 3 min. The density of rime accreted in a supercooled cloud inside a wind tunnel was found to be a function of  $(rv_0/T_0)$ , where  $r$  is the cloud droplet median volume radius,  $v_0$  the droplet speed of impact upon the rime, and  $T_0$  is the depression below 0°C of the rime surface. The drag coefficients of hailstones do not exceed those for smooth spheres. Also, radar and ground observations were obtained in unprecedented detail during a storm which produced hailstones up to 2 in. A new cumulonimbus model and a new theory of the growth of large hail were developed. -- BLE



# CRREL BIBLIOGRAPHY

SIP 22252

551.345:550.8:621.317.~\*3)

Stozharov, N. B.  
APPLICATION OF ELECTRIC PROSPECTING  
UNDER PERMAFROST CONDITIONS. (Primenenie  
metodov elektrorazvedki v usloviakh vechnoy  
merzloty; Text in Russian). Geofizicheskie Metody  
Razvedki v Arktike, 132(4):204-214 incl. tables,  
1962. 14 refs.

DLC, QE70.L43

This paper reviews the tasks, methods and results of electric prospecting in the Arctic regions by the Soviet Union since 1935. Typical for all these regions is the frozen depth of up to 400 m, which accounts for a limited scope of electric prospecting, which is applied, combined with other methods, to the solution of the following problems: (1) investigation of the permafrost depth, physical state of soils, and the extension of frozen depth and thawed zone boundaries; (2) prospecting ore deposits; and (3) depth determination of Quaternary deposits for a correct orientation and rational organization of placer gold prospecting. A new field of possible application is oil and gas prospecting. However, the electric prospecting, especially that on low-frequency alternating current, has not found the application it deserves, notwithstanding the positive results achieved with it in northern regions. Methods of electric prospecting on low-frequency alternating current, using the equipment developed in 1959, have a number of advantages in comparison with electric prospecting on direct current; therefore, it is expected that the application of these methods will prove expedient and effective. (ATL abstract, modified)

SIP 22253

550.93:539.16(\*58)

551.336:551.79(\*58)

Holmes, G. Williams and Bjorn G. Andersen  
GLACIAL CHRONOLOGY OF ULLSFJORD,  
NORTHERN NORWAY. U. S. Geol. Survey Profess.  
Paper 475-D:159-163 incl. table, graph, diag.,  
map, 1964. 5 refs.

DLC, QE75.P9

Quaternary features of Ullsfjord record Late Glacial fluctuations of the Fennoscandian ice sheet and of local alpine glaciers. The earliest known advance left erratics and subdued moraines near the coast. The subsequent Breidvika advance formed lateral moraines which continue into the sea as sharp submarine end moraines. Shortly thereafter the Skardmunkun advance also resulted in moraines with both terrestrial and marine facies. Radiocarbon dates of marine shells place the Skardmunkun maximum between 11,500 and 10,300 yr (late Allerød and Younger Dryas time). A nearly continuous beach level, probably the "main beach level" of northern Norway, is cut in bedrock and unconsolidated materials from the outer coast to the top of the deltaic sediments of the Skardmunkun moraine. Shortly after the Skardmunkun advance, the Stordal advance left small moraines and deltas at a level slightly

below the projection of the "main beach level."

Lastly, cirque glaciers deposited steep unweathered moraines in historic time. (Authors' abstract)

SIP 22254

551.511.6(\*3)

Kovrova, A. M.  
DESCRIPTION OF FREE ATMOSPHERIC TURBULENCE IN THE EASTERN SECTOR OF THE ARCTIC. (Kharakteristika turbulentnosti svobodnoy atmosfery v vostochnom sektore Arktiki; Text in Russian). Problemy Arktiki i Antarktiki, No. 10: 55-61 incl. tables, graphs, 1962. 7 refs.

DLC, G575.L422

The turbulence which produces aircraft bump effects was studied from data obtained in temperature-anemometric probes at Cape Schmidt and Providence Bay in Jan. 1958-1960, and during April, July, and Oct., 1958-1959. Values of the Richardson number (Ri) were used as an index of the degree of turbulent energy. In view of the lack of a critical value for Ri in the Arctic, its critical values for the temperature latitudes were used. A computation was made for each layer of the probability (P) of the turbulent state of the atmosphere from the formula  $P = (n/m) 100\%$ , where n is the number of points above the corresponding curve, and m is the number of observations for the layer. For Providence Bay in July 1958-1959 in the 0-1-km layer the probability of strong turbulence was 20.6 and 34.3% respectively, while that of weak turbulence was 53 and 60.8%. The main turbulence-recurrence maximum lies in the 0-1-km layer, the secondary one occurs under the tropopause, and the minimum is in the 2-5 km layer. In the lowest 1-km layer the greatest turbulence recurrence is observed during the cold period. This is explained by the interaction of the Bering and Okhotsk cyclones with the crests of the Siberian anticyclone. In Jan. and April the intensified turbulence ( $Ri < 1$ ) in the 0-1-km layer is determined largely by the dynamic (large wind discontinuities) factor, by the thermal factor in the warm period, and by the thermodynamic factor in Oct. (RZh, Mekhanika abstract, modified)

SIP 22255

551.574.7:629.13(\*50)

Pavlov, V. V. and A. E. Ovsinnikov  
METHOD FOR DETERMINING THE DEGREE OF ICING ON AIRCRAFT. (Sposob opredeleniya intensivnosti obledeneniya samoleta; Text in Russian). Bgill. Izobretenii, No. 852, 1963. (USSR Patent No. 154064)

DLC, T285.A34

The patent introduces a method for determining the degree of icing on aircraft. Two temperature sensors are mounted in the leading and trailing edges of the wing. To increase the accuracy of measurements the leading and trailing edges are subjected to continuous heating. (ATD abstract)

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SIP 22256 551.574.13:551.576:551.507.362.1(\*3)

Bronshten, V. A.  
ROCKETS STUDY THE SILVERY CLOUDS. (Rakety isuchaiut serebristye oblaka; Text in Russian). Priroda, No. 1:95-99 incl. illus., diagrs., 1964. 4 refs.  
DLC, Q4.P8

During the period 1954-1961, I. A. Khvostikov and the author refined (from USA and USSR rocket measurements) the glacial hypothesis which concerns the silvery clouds appearing only in summer at 75-90 km, between lat. 50° and 60°. This hypothesis compares the change in air pressure with altitude and the elasticity of saturated vapor at the temperature prevailing at the same altitude, and concludes that the condition necessary for the formation of ice crystals from water vapor is also fulfilled below 30 km. A seasonal temperature variation facilitates the formation of silvery clouds in the summer, and accounts for their fine structure and the characteristics of their spectrum. A compromise hypothesis (meteor particles from nuclei of congelment) was proposed to explain the origin of the water vapor. This explains the appearance of bright silvery clouds at night after the Tungus meteorite fell, and also some statistical agreements between the appearance of silvery clouds and increased meteoric activity. Data are given from a detailed numerical analysis of this hypothesis (1959), and the capture of such meteor particles near the Arctic Circle in 1962 is described. The size of these particles confirms estimates made from photometric observations. (ATD abstract, modified)

SIP 22257 551.326.6:551.508.85:(\*733/\*746)

Dmitrash, Zh. A.  
PHOTORADAR RECORDING OF ICEBERGS. (Fotoradarnai s'emka al'bergov; Text in Russian). Sovet. Antarkticheskai Eksped., Trudy, 20:Chetvertyi i piatyf relay d/e "Ob", 1958-1960 gg.; nauchnye resul'taty i materialy nabliudeni. Leningrad, Izd-vo Morskof transport, 1962, p. 141-154 incl. illus., table, diagrs., map.  
DLC, G860.S63

Icebergs were counted during the voyage of the Ob' along the Antarctic coast from 95° E to 10° E, then north to about lat. 50° S. The icebergs were counted by photographing every hour the screen of a 'Neptun'-type radar indicator with a miniature single-lens reflex 'Zenit' camera using DN film. Fifteen- and five-mile range displays were the main types recorded. The distance of icebergs indicated by radar had to be corrected for the condition of the atmosphere and sea surface, vertical dimensions of the bergs, and height of the aerial. The results are tabulated and presented in the form of two-hour averages of the number of icebergs on a chart of the ship's course from Dec. 27, 1958 to March 18, 1959. (ATD abstract, modified)

SIP 22258

551.509.31:551.326.8(\*41)

Bilello, Michael A.  
ICE PREDICTION CURVES FOR LAKE AND RIVER LOCATIONS IN CANADA. Res. Rept. 129, U. S. Army Cold Regions Research and Engineering Laboratory, 12p. incl. tables, graphs, map, appendixes A-B, July 1964. 8 refs.  
CRREL files

Methods for predicting ice formation are reviewed in a study on formation, growth, and decay of sea ice. From the relationship between mean daily temperatures and the date of ice formation, a series of curves were developed to provide a single operational method of predicting ice formation at 1 bay, 10 lake, and 17 river locations. Fort Good Hope is used as an example in this report. The first appearance of ice in the fall, and the date of complete ice coverage are considered. For 19 stations, numerical constants and forecast curves are derived for only one of the periods because of insufficient data. To apply the curves, an adjusted temperature record, based on a numerical constant (N) and daily air temperatures, is maintained starting in early summer. Subsequently, this daily-adjusted temperature is applied to the family of curves to provide a day-to-day forecast of the date of ice formation. (Author's abstract)

SIP 22259

69.035.4:624.042.42:624.147

Mellor, Malcolm  
UNDERSNOW STRUCTURES: N-34 RADAR STATION, GREENLAND. Tech. Rept. 132, U. S. Army Cold Regions Research and Engineering Laboratory, 29p. incl. illus., tables, graphs, diagrs., Aug. 1964. 7 refs.  
CRREL files

Data previously obtained in a program of instrumentation and observation to appraise the performance of radar station N-34 built at an altitude of about 7000 ft in the dry-snow zone of the Greenland Ice Cap are condensed and presented. N-34 consisted of prefabricated buildings erected inside tubular corrugated-steel shells and the whole complex was interconnected with a closed network of steel tubes. The snow cover accumulation on the abandoned station, from 1957 to 1963, of more than 20 ft is still being restrained by the structural shells. Observations of long-term effects on this unique structure are utilized to analyze new and existing data in evaluating design concepts. Structural deformation, differential settlement, and heat loss are discussed, and some remarks relevant to future design are made. (See SIP 14619 and 14904) (Author's abstract)

# CRREL BIBLIOGRAPHY

SIP 22260 551.578.7:551.577.61:551.509.21(78)

Frisby, E. M.  
RELATIONSHIP OF GROUND HAIL DAMAGE PAT-  
TERNS TO FEATURES OF THE SYNOPTIC MAP IN  
THE UPPER GREAT PLAINS OF THE UNITED  
STATES. J. Appl. Meteorol. 1(3):348-352 incl.  
diags., maps, Sept. 1962. 1 ref.  
DLC, QC851.A66

Hail insurance claims have been plotted for 1951-1960 for each hail storm affecting the crop during each crop season. Attention was focused on hail damage patterns originating east of the Missouri River. Weather Bureau maps for the main synoptic hours were used throughout the analysis. Damaging hail storms occurred in South Dakota on 515 days during the 10-yr period, giving an average of about 52/yr between May and Sept. The damage patterns fell into 3 main groups: (1) those occurring in swath-type patterns with a northwest to southeast slant; (2) those occurring in groups along a slightly curved line or series of lines lying southwest to northeast; and (3) those occurring in clusters without easily recognizable form. The forecaster is still dependent on radio-sonde data, the Showalter Stability Index, and radar information concerning cloud height and echo brightness for his first clues as to the probable presence or imminent formation of hail in a given cloud mass. However, once the swaths have started and their direction is known, they can be expected to be 150-200 mi long with widths varying from 5 to 15 mi. Speed of movement appears to exert considerable influence on the extent and degree of ground hail damage. According to observations made during 1959 and 1960, a damaging hail swath coincided with the highest precipitation values and formed a hard core from which precipitation values decreased in all directions. -- BLE

SIP 22261 551.578.7:551.509.3(76-78)

Pappas, John J.  
A SIMPLE YES-NO HAIL FORECASTING TECH-  
NIQUE. J. Appl. Meteorol. 1(3):353-354 incl.  
table, graph, Sept. 1962. 6 refs.  
DLC, QC851.A66

Seventy severe convective storms (34 hail-producing and 36 non-producing) were examined during the spring and summer of 1959 and 1960 with respect to cloud depth below the freezing level and cloud height in order to develop an objective hail forecasting method. The area of study includes Texas, Oklahoma, Kansas, and Nebraska. The storms were listed by date, place, phenomenon, and time of occurrence, and representative upper-air soundings for each case were plotted on the skew T log P diagram. They were then analyzed for 3 parameters: (1) the convective condensation level (CCL), (2) the equilibrium level (EL), and (3) the freezing level. After several trials with various combinations of the above parameters, the best results were obtained with (1) the ratio of the cloud depth below the freez-

ing level (distance from CCL to freezing level) to the cloud's estimated vertical development (distance from CCL to EL), defined as the "cloud depth ratio" and (2) the height of the freezing level as predictors. With some modification of the scattergram, this method could serve as the basis for the development of a local forecasting tool for other areas. The method showed common and Appleman skill scores of +65 and +66, respectively. -- BLE

SIP 22262 551.322:536.4.031:551.576

Schaefer, Vincent J.  
CONDENSED WATER IN THE FREE ATMOSPHERE  
IN AIR COLDER THAN -40°C. J. Appl. Meteorology,  
1(4):481-488 incl. illus., Dec. 1962. 10 refs.  
DLC, QC851.A66

Observations of atmospheric clouds formed by hot springs and geysers were made at Yellowstone Park in winter with free atmospheric temperatures warmer and colder than -40°C. Despite careful observations, no evidence could be found of the formation of supercooled clouds at temperatures below -40°C. Replicas made of the particles existing under varying atmospheric conditions showed that clouds formed with air colder than -40°C consisted mostly of frozen, irregularly shaped particles. Liquid droplets were commonly found at temperatures above -40°C. Optical phenomena were virtually absent in the ice particle fogs that formed below -40°C. Very complex and spectacular halos, pillars, arcs, and circles occurred after the supercooled clouds formed at temperatures above -40°C were seeded with dry ice or silver iodide. (Author's abstract)

SIP 22263 551.576:551.521.1

Vowinkel, E. and Svenn Orvig  
RELATION BETWEEN SOLAR RADIATION INCOME  
AND CLOUD TYPE IN THE ARCTIC. J. Appl.  
Meteorol. 1(4):552-559 incl. tables, diagr., Dec.  
1962. 11 refs.  
DLC, QC851.A66

Cloud amount and duration of sunshine are generally used to estimate direct and diffuse solar radiation income at the ground, where radiation instruments are not available. This method has serious drawbacks, and a consideration of cloud type is also necessary. The different elements required for the calculation of radiation income at the ground are discussed. Such calculation can give only general results, and measured values of radiation in the Arctic, with different cloud types, are therefore examined and presented. The magnitude is discussed of the values in the Arctic of albedo of cloud tops, water content of clouds, ground albedo, and the effect of composite cloud types. From the results it is possible to construct tables which show the depletion factor with 10/10 cloud cover for different combinations of cloud

# CRRRL BIBLIOGRAPHY

type frequencies. These tables make it possible to obtain approximate radiation income with mean overcast conditions, provided that the clear-sky radiation is known. The results are applicable to the Polar Ocean and Arctic Coast only. (See SIP 20953) (Authors' abstract)

SIP 22264

551.33(77)

Leighton, Morris M. and Paul MacClintock  
THE WEATHERED MANTLE OF GLACIAL TILLS BENEATH ORIGINAL SURFACES IN NORTH-CENTRAL UNITED STATES. J. Geol. 70(3):267-293 incl. illus., tables, graphs, May 1962. 38 refs. DLC, QE1.J8

This paper: (1) gives a historical perspective of weathered zones of glacial tills, (2) reviews changes in concepts and techniques, geologically and pedologically, (3) notes the neglect of clay microscopy in the study and appraisal of profiles of weathering since the work of Allen on gumbotils 30 yr ago, (4) explores the elements of soil profiles and profiles of weathering and their relationships, (5) analyzes recent discussions concerning gumbotils, "leached wash," gley, and accretion gley, (6) criticizes the mineralogical studies recently made of weathering profiles of Kansan and Illinoian tills, and (7) emphasizes the need for a comprehensive study of weathering of the several glacial drift sheets. (Authors' abstract)

SIP 22265

551.481.1:551.3:(1-16)(+49)

Carson, Charles E. and Keith M. Hussey  
THE ORIENTED LAKES OF ARCTIC ALASKA. J. Geol. 70(4):417-439 incl. illus., tables, graphs, diagra., maps, July 1962. 21 refs. DLC, QE1.J8

Elongate thaw-lake basins forming in the frozen ground of the Alaskan Arctic Coastal Plain are aligned 10°-15° west of true north. To test the hypothesis that prevailing winds elongated these basins, detailed maps and velocity determinations of wind-controlled current systems were made with sodium fluorescein dye and aluminum floats. The effect of wave action was studied in basins of all sizes; morphology and sediment distribution were mapped; and water temperatures were recorded with thermographs. Supporting investigations were made of moisture content and fluctuation of the active layer in the frozen ground. A combination of processes produce a uniformly oriented basin morphology which consists of sublittoral shelves on the east and west sides of the lakes and a deeper central basin that extends to the north and south ends. Easterly and westerly winds, prevailing nearly normal to the axis of orientation, drive wave action which forms sublittoral shelves and bars that eventually come to protect the east and west side from thaw and erosion. The development of the sublittoral

profiles soon comes to equilibrium for a given basin depth since depth, in shallow water, closely controls wave velocity. At equilibrium, or maximum development of sublittoral shelves, east-west expansion at minimal, but north-south expansion is uninhibited by the presence of shelves and bars. It is increased by wind-driven currents, wave attack, and warmer water temperatures in the ends. (Authors' abstract, modified)

SIP 22266

551.324.431(574.51)

Makarevich, K. G.  
ORGANIZATION AND CONDUCTING OF SCIENTIFIC RESEARCH ACCORDING TO THE PROGRAM OF IGY AT MALAYA ALMATINKA GLACIERS IN TRANS ILI ALATAU. (Organizatsiya i provedenie nauchno-issledovatel'skikh rabot po programme MGG na Maloalmatinskikh lednikakh v Zailiyskom Alatau; Text in Russian with English summary). p. 5-12 incl. illus. (In: Glatsiologicheskie issledovaniya v period MGG; Zailiyskiy i Dzhungarskiy Alatau, Vyp. 1. Alma-Ata, Izd-vo Akad. nauk Kazakhskoy SSR, 1961). 30 refs. DLC, QE575.A4

The work which started on July 1, 1957, consisted of studying the meteorological and radiation regime of the alpine glacial zone, the moisture and thermal exchange between the glaciers and adjacent layer of air, the snow cover, snow accumulation, and the conversion of snow into firn and ice. The physical properties of snow, firn, and ice; the thickness, motion and spatial condition of the glaciers, and their hydrological and temperature regimes were also included. In the summer of 1958 German and Kazakh scientists carried out a stereophotogrammetric survey of the glaciers, conducted hydrometric work in the glacial streams and at sources of the Malaya Almatinka River, and studied the thermal balance of the glacier ice -- atmosphere system. The work was concluded in Dec. 1959. Data on many geological processes, which occur in the alpine glacial zone of the Trans Ili Alatau and directly in and on the glaciers were also collected. (From author's summary)

SIP 22267

528.02:551.324(574.51)

Barvenko, N. A. and K. G. Makarevich  
A BASE NETWORK ON THE MALAYA ALMATINKA GLACIERS. (Opornaya set' na Maloalmatinskikh lednikakh; Text in Russian with English summary). p. 23-30 incl. illus., tables, graphs. (In: Glatsiologicheskie issledovaniya v period MGG; Zailiyskiy i Dzhungarskiy Alatau, Vyp. 1. Alma-Ata, Izd-vo Akad. nauk Kazakhskoy SSR, 1961). DLC, QE575.A4

A base geodetic network was established in the Malaya Almatinka glacier area in preparation for the IGY glaciological research. Twenty-seven bench

marks were cemented in place, each marked by a cross-piece at the upper end of a metal stake 160 cm high. Four of the bench marks were set into the moving substratum of the frontal moraines and were frequently checked to ascertain their plane and alpine coordinates. The remaining benches were fixed in solid rock foundations. It is probable that most of the bench marks will remain intact and would be utilized for further investigation of glaciation on the upper reaches of the Malaya Almatinka River. (From authors' summary)

SIP 22268

622.34:551.324(574.51)

Vilesov, E. N. and P. F. Shabanov  
ON EXPERIMENT OF BORING ON ALPINE GLACIERS. (Iz opyta bureniya na vysokogornyykh lednikakh; Text in Russian with English summary). p. 31-36 incl. tables. (In: Glitsiologicheskie issledovaniya v period MGG: Zailiyskiy i Dzhungarskiy Alatau, Vyp. 1. Alma-Ata, Izd-vo Akad. nauk Kazakhskoy SSR, 1961).  
DLC, QE575.A4

Characteristics are given on equipment used for boring deep holes on glaciers of the Tuyuksu group in the Trans Ili Alatau during the period of the IGY-IGC in 1957-1959. Data on boring speed in ice and firn are related to the density, productivity of labor, depending on the depth of face of the bore hole, etc. Scientific results on boring and practical propositions for further utilization of rotary boring under alpine conditions are included. (From authors' summary)

SIP 22269

551.506:551.324.4(574.51)

Kalmynkina, E. M.  
ON THE TEMPERATURE GRADIENT OF THE TRANS ILI ALATAU. (O temperaturnom gradiente v Zailiyskom Alatau; Text in Russian with English summary). p. 44-51 incl. tables. (In: Glitsiologicheskie issledovaniya v period MGG: Zailiyskiy i Dzhungarskiy Alatau, Vyp. 1. Alma-Ata, Izd-vo Akad. nauk Kazakhskoy SSR, 1961).  
DLC, QE575.A4

Data from meteorological stations in the glacial zone, have supplemented the vertical climatic profile of the Trans Ili Alatau ridge. Attention is focused on calculations of the temperature gradient and its distribution over the vertical profile of the ridge, and on analyses of the temperature conditions. The most suitable for the entire ridge profile is the temperature gradient between the points of Alma-Ata and Myn-Dzhilki, that has an annual average of 0.48-0.53, and 0.64-0.71 during the warm period. The most representative stations are the Tuyuksu II (3470) and Tuyuksu III (3750). It is recommended to make use of the gradient between these two stations, which equals 0.72-0.75 during the year, and 0.63-0.67

during the warm period. The interyearly distribution of gradients in the glacial zone has its own peculiarities, which differ from the general types, and make it characteristic of the Trans Ili Alatau alpine profile. The general regularity of the gradient distribution in the Trans Ili Alatau can be applied to all mountain regions in southeast Kazakhstan. (From author's summary)

SIP 22270

551.324.412(574.41)

Vilesov, E. N.  
PRELIMINARY RESULTS OF THE ICE TEMPERATURE MEASUREMENTS ON THE CENTRAL TUYUKSU GLACIER. (Predvaritel'nye rezul'taty izmereniy temperatur l'da lednika Tsentral'nogo Tuyuksuskogo; Text in Russian with English summary). p. 95-105 incl. tables, graphs. (In: Glitsiologicheskie issledovaniya v period MGG: Zailiyskiy i Dzhungarskiy Alatau, Vyp. 1. Alma-Ata, Izd-vo Akad. nauk Kazakhskoy SSR, 1961). 10 refs.  
DLC, QE575.A4

Temperature regime data of the lower Central Tuyuksu glacier were obtained from specially laid boreholes, from Sept. 15, 1958 to Sept. 3, 1959. Measurements were made with the aid of platinum electrothermometers set at depths of 0.5 to 52 m. The results showed the dense glacier tongue formation to be in a freezing state at all depths and at all seasons, with the exception of "crust melting." Three basic temperature zones were marked out, surface zone at -10 to 0°; inner zone at -3.5 to -1.8°; and deep zone at -1.8 to -0.7° C. Interglacial processes, principally the glacier movement, influence the temperature conditions of the deep strata. --  
EP/FMM

SIP 22271

551.332.53:551.49.918(574.51)

Borovinskiy, B. A. and L. A. Vilesova  
EXPERIMENTAL ELECTROMETRY IN STUDYING THE HYDROLOGICAL FEATURE OF MORAINES. (Opyt primeneniya elektrometrii v izuchenii gidrologicheskikh osobennostey moren; Text in Russian with English summary). p. 106-112 incl. graphs. (In: Glitsiologicheskie issledovaniya v period MGG: Zailiyskiy i Dzhungarskiy Alatau, Vyp. 1. Alma-Ata, Izd-vo Akad. nauk Kazakhskoy SSR, 1961). 7 refs.  
DLC, QE575.A4

The physiography of the Tuyuksu Glacier region is described including the hydrology of its moraines. Electrical circuitry to determine seepage from glacial lakes, characteristics of underground flow, filtration velocity, and other hydrological conditions were investigated with the use of NaCl as electrolyte.

Methods of introducing the NaCl into the morainal areas and measuring the electrical potential in the soil are explained in detail. The experimental measurements made on August 27-28, 1958, indicated the effectiveness of applying a variation of the Slichter method to the study of hydrological conditions in general and water filtration through moraines in particular. -- EP/NZ

SIP 22272 551.332:53:551.321.61(574.51)

Borovinskiy, B. A.  
ELECTRICAL SURVEY ON MORAINES OF THE MALAYA ALMATINKA GLACIERS. (Elektrorazvedochnye raboty na morene Maloalmatinskikh lednikov; Text in Russian with English summary). p. 113-135 incl. tables, graphs, diagrs. (In: Glafologicheskie issledovaniya v period MGG: Zailiyskiy i Dzhungarskiy Alatau, Vyp. 1. Alma-Ata, Izd-vo Akad. nauk Kazakhskoy SSR, 1961). 6 refs. DLC, QE575.A4

The electrical properties of moraine structure are given for five basic types: (1) non-frozen moraine, (2) frozen deposits with variable resistance, (3) frozen strata with constant resistance, (4) ice lenses and ice islands covered with moraine, and (5) glacier beds. Investigation procedures are described in detail and collected data analyzed. A region of nonuniform igneous bedrock was encountered at a 50-100-m depth. The uneven distribution of buried ice in moraines is associated with local meteorological conditions. Formation of melt-water lakes in summer affects wide development of erosion and thermokarst phenomena. -- EP/NZ

SIP 22273 551.321.61(574.51)

Pal'gov, N. N.  
THE THICKNESS OF THE KAZAKHSTAN GLACIERS AND THE ACCURACY OF METHODS OF ITS DETERMINATION. (Moshchnost' lednikov Kazakhstana i oshenka metodov ee opredeleniya; Text in Russian with English summary). p. 136-149 incl. tables, diagrs. (In: Glafologicheskie issledovaniya v period MGG: Zailiyskiy i Dzhungarskiy Alatau, Vyp. 1. Alma-Ata, Izd-vo Akad. nauk Kazakhskoy SSR, 1961). 8 refs. DLC, QE575.A4

Thicknesses of 19 Kazakhstan glaciers have been measured at 65 points by five different methods: trigonometric (distance and slopes of glacier surface and bed), Lagally (annual velocity and surface slope), balance (area, width, motion, and melting of glacier), seismic sounding, and electrical sounding. Each method and its application is described in detail and data are tabulated. The best results were obtained by the electrical sounding and balance methods. The trigonometric method was eliminated because its use

is restricted by morphological features of glaciers. The Kazakhstan Glaciers measured are 1.7 to 8 km in length with areas from 0.9 to 20.6 km<sup>2</sup>, and belong to valley, hanging valley, cirque, and shelf types. The maximum thickness found was 250-300 m and minimum of 35-36 m. Data on percentage of similarity of indices of glacier thickness determined by the four survey methods, and data on thickness of glaciers in relation with distance from the end of their open tongues are tabulated. (See SIP 19723) (From author's summary)

SIP 22274 551.331.5(574.51)

Gerasimov, V. A.  
TRACES OF OLD GLACIATION IN THE TRANS ILI ALATAU. (O sledakh drevnego oledeniya v Zailiyskom Alatau; Text in Russian with English summary). p. 150-169 incl. illus., diagrs. (In: Glafologicheskie issledovaniya v period MGG: Zailiyskiy i Dzhungarskiy Alatau, Vyp. 1. Alma-Ata, Izd-vo Akad. nauk Kazakhskoy SSR, 1961). 21 refs. DLC, QE575.A4

The traces of two glaciations were noted in the river valleys of the Trans Ili Alatau. The last (Vurm) glaciation is represented everywhere by sculptural forms and accumulations of three main stages. Low fluvioglacial terraces, of which the upper terrace is more pronounced than the others, characterize the moraines of different stages. The upper terrace (of the first stage) forms the lower layer of terraces shaping the transverse valleys. In the alpine parts of the valley, terrace heights increase up to 150 m and then gradually disappear in the transverse profile of the upper valley. The moraines of the second stage of glaciation are located in the bottom of the troughs cut at this point. The moraine of the third stage is situated directly near the ends of the contemporary glaciers, sometimes completely covered with the top moraine. The contemporary moraine contains dead ice everywhere, and is separated from the glaciers by 2-3 km. The traces of the preultimate (Riss) glacial epoch are recognized by the sculptured remnants of ridge slope cleavages. The moraine that apparently belongs to this glacial epoch is known to be on the northern slope of the Karatch ridge where it is part of the 140 m high terrace of the Baysaur territory. The tectonic elevation of the ridge since the Riss glacial epoch is 400 m. (From author's summary)

SIP 22275

551.331.5(574.51)

Cherkasov, P. A. and V. A. Zenkova  
THE HISTORY OF RESEARCH ON CONTEMPORARY  
AND ANCIENT GLACIATION OF THE RIDGE  
DZHUNGARIAN ALATAU. (Istorija issledovaniia  
sovremennogo i drevnego oledeneniia khrebita  
Dzhungarskii Alatau; Text in Russian with English  
summary). p. 170-182 incl. illus. (In: Glatsiolo-  
gicheskie issledovaniia v period MGG. Zaititskii i  
Dzhungarskii Alatau. Vyp. 1. Alma-Ata, Izd-vo  
Akad. nauk Kazakhskoi SSR, 1961). 47 refs.  
DLC, QE575.A4

Past information on the Dzhungarian Alatau glaciers  
has been principally visual morphological and mor-  
phometrical data about contemporary and ancient gla-  
ciation of the ridge. In 1947 observations on glacier  
ablation, motion, and area conditions were made at  
the Lepsa, Basken, and Kora-Karatal river basins.  
During the IGY program, the Lepsa, Terekty,  
Baskan and Sarkan river glaciers were extensively  
observed and explored. (From authors' summary)

SIP 22276

551.336:551.79(931)

Woldstedt, Paul  
NEW ZEALAND GLACIATION AND THE PROBLEM  
OF ITS SIMULTANEITY WITH THE EUROPEAN  
GLACIATIONS. (Die Vergletscherung Neuseelands  
und die Frage ihrer Gleichzeitigkeit mit den  
europäischen Vereisungen; Text in German with  
English abstract). Eiszeitalter u. Gegenwart, 12:  
18-24 incl. table, map, 1962. 11 refs.  
DLC, QE696.E3

The Pleistocene sequence of Wanganui (North Island  
of New Zealand) and the successions of glaciations in  
the South Island are reviewed. The last glaciation  
and the postglacial time in New Zealand occurred,  
according to C14 determinations, simultaneously with  
those of the Northern Hemisphere. If this is true,  
the earlier glaciations must also have been simulta-  
neous. This does not agree with the Milankovitch-  
curve, which, in the form that it is given, cannot  
have been the cause of the ice ages. (Author's ab-  
stract, modified)

SIP 22277

551.336:551.79(566)

Wright, H. E.  
PLEISTOCENE GLACIATION IN KURDISTAN.  
Eiszeitalter u. Gegenwart, 12:131-164 incl. illus.,  
tables, graphs, diagrs., maps, 1962. 46 refs.  
DLC, QE696.E3

New evidence is presented for the extent of glaciation  
in Kurdistan (a mountain region where Iraq, Turkey,  
and Iran join together), and older evidence is re-  
viewed. The critical glacial features are assigned to  
the last glacial phase. Depression of the snowline is

generally attributed to a reduction in atmospheric  
temperature or to an increase in snowfall. Even if  
Pleistocene temperature was deeply depressed in the  
mountains in Kurdistan, it is difficult to believe that  
the mean annual temperature in the Kurdish piedmont  
and the Mesopotamian lowland was 12°C lower than  
the present. No geologic or paleontologic evidence  
can be adduced to support such a change. The effect  
of change in snowfall on the elevation of the snowline  
is difficult to segregate from the effect of tempera-  
ture change. For the Kurdish mountains, conditions  
of greater snowfall must be postulated if the in-  
ferred 1200-1800-m depression of snow cover was  
not entirely a result of temperature depression.  
Evidence from glaciation indicates that the Pleisto-  
cene climate was colder and wetter in the foothills  
and piedmont, but the change to a postglacial climate  
like the present was essentially complete 11,000-  
9000 yr ago. -- BLE

SIP 22278

551.336:551.79:551.417(94)

Woldstedt, Paul  
INTERGLACIAL MARINE SHORELINES IN AUSTRA-  
LIA. (Interglaziale marine Strände in Australien;  
Text in German with English abstract). Eiszeit u.  
Gegenwart, 12:60-65 incl. table, map, 1962. 12 refs.  
DLC, QE696.E3

The raised beaches contain mollusks and are weath-  
ered and oxidized. Deep river troughs, which are  
filled with young unweathered marine deposits, are  
also present. These terraces extend to 10 ft above  
sea level and, according to C14 determinations,  
some belong to the postglacial climatic maximum.  
The fossil sand dunes present are described and the  
ages of the old shore lines in South Australia are  
tabulated. In Tasmania interglacial shorelines are  
developed as high as 60-70 ft. Since the faunas of  
the old high sea levels of the Southern Hemisphere  
were warm, they must belong to the interglacials  
which occurred simultaneously on both hemispheres.  
-- BLE

SIP 22279

551.331.55:551.79(43)

Richter, Konrad  
THE AGE OF GLACIAL STRIATIONS AT VELPKE.  
(Das Alter der Gletscherachrammen von Velpke;  
Text in German with English abstract). Eiszeitalter  
u. Gegenwart, 12:125-130 incl. diagrs., 1962. 4  
refs.  
DLC, QE696.E3

The ice sheets that overlite the Rhaetic sandstone with  
its 2 systems of glacial striae have been investi-  
gated and the presence of ground moraines partly  
overlying other ground moraines has been proved.  
The oldest of these moraines produced the early  
system of striation. By proving the gradual modifi-  
cation of the striation in the direction of a glacial

movement recognized as having taken place during the Elster glaciation, it appears possible that the younger direction was caused by another glacial advance during the late Elster glaciation. Another possible origin of the striae is suggested by the presence of minute forms of glaciated rock along parabola ruptures. The research methods permitted the detection of differentiated courses of ice movement and hence subdivisions of a glaciation in other exposures of ground moraines. (Author's abstract, modified)

SIP 22280

551, 578, 463: (\*38, \*7)

Glovinetto, Mario B.  
DISTRIBUTION OF DIAGENETIC SNOW FACIES IN ANTARCTICA AND IN GREENLAND. *Arctic*, 17(1): 32-40 incl. map, March 1964. 32 refs.  
DLC, G600.A695

The areas of the zones of particular diagenetic snow facies are estimated for Antarctica and compared with areas estimated for Greenland. The ablation facies covers less than 1% of the area of the Antarctic ice sheet as opposed to 15% in Greenland. The percolation and soaked facies cover approximately 10% of Antarctica as compared to about 20% in Greenland. The dry snow facies covers 90% of the Antarctic ice sheet including ice shelves, which is three times larger than in Greenland. Whereas the dry snow line in Greenland lies at an altitude of 3100 m at 69° N and 1700 m at 81° N, in Antarctica it is found between 500 and 1000 m at 87° S (near 54° E) and only 100 m at 85° S (near 165° W). In relation to the mean annual air temperature, the dry snow line in Greenland lies between the -15° and -28° C isotherms, while in Antarctica it lies between the -15° and -25° C isotherms. -- GAD

SIP 22281

546, 21:551, 578, 4:551, 322(\*7)

Epstein, Samuel, Robert P. Sharp and Irene Goddard  
OXYGEN-ISOTOPE RATIOS IN ANTARCTIC SNOW, FIRN, AND ICE. *J. Geol.* 71(6):698-720 incl. tables, graphs, diagra., map, Nov. 1963. 61 refs.  
DLC, QE1.J8

O-18/O-16 ratios of 550 specimens of snow, firn, and ice predominantly from West Antarctica have been determined. Oxygen isotope ratio curves with seemingly normal seasonal characteristics obtained at Amundsen-Scott, Byrd, Little America, and Wilkes-satellite Stations consistently suggest accumulation rates 20-100% greater than determined by surface measurements and pit stratigraphy. New-fallen snow at Ellsworth Station shows the usual direct variation in  $\delta^3$  ( $\delta$  = deviation from the ratio of a standard) of the O-18/O-16 ratio with temperature over an impressively large range. Samples

taken within individual snowfalls display different  $\delta$ /temperature relationships depending upon the nature and history of the air masses involved. Samples of wind-drifted snow from Little America have a seasonal flavor, but their  $\delta$  values are considerably lower than those of snow from a nearby pit. A possible explanation of this anomaly is that some of the wind-driven snow comes from inland sources, possibly as much as 500 km away. Another possibility is that wind action produces mechanical separation favoring accumulation of ice particles with higher  $\delta$  values. The low  $\delta$  material may end up in the ocean. Quantitative relationships between variations in  $\delta$  and surface air temperature, upper-air temperature, and tropospheric temperature are not impressive. Lack of consistency in the  $\delta$ /surface-air temperature relationship can be attributed to the strong inversion frequently prevailing in Antarctica; but even the influence of upper-air and tropospheric temperatures appears to be variable. (Authors' abstract, modified)

SIP 22282

551, 58(\*2)

Budyko, M. I.  
CLIMATIC CHANGE AND CLIMATE CONTROL. (Izmenenie klimata i puti ego preobrazovaniya; Text in Russian). *Vest., Akad. nauk SSSR*, 32(7):33-37, July 1962. (Eng. transl.: U. S. Air Force, Cambridge Res. Lab., Contract AF 19(628)-3880, Res. Transl. T-R-436\*, 7p., April 1964).  
DLC, AS262, A627

Heat balance data show that the main reason for the lower summer temperatures in high latitudes is the ice cover of the Arctic Ocean and of Antarctica. Because of the high albedo of snow, most of the total radiation in high latitudes is reflected. If there were no ice cover in the Arctic the temperatures would range from +10° to +20° C in summer to +5° to +10° C in winter. Sharp climatic changes would result and ice could not re-form. Similar changes would occur if the ice cap of Antarctica disappeared. However, because of the differences in the heat balance of the continent and ocean, summer temperatures would be higher than in the Arctic, while the winter temperatures would be lower. If world-wide glaciation should occur, the surface air temperature would decrease about 100° C, due to the albedo increase and atmospheric transparency. Artificial climate controls such as dry-ice seeding of clouds, direct control of air currents to change the trajectories of air masses, scattering of dust in the atmosphere to change radiation fluxes, and modification of atmospheric electric processes are a few methods of transforming climate for the benefit of man. Modification of the Arctic ice cover may have drastic consequences, however, and should be thoroughly investigated before such action is taken. -- JFS



SIP 22283

551.337:535.37:550.93:(\*7)

Ronca, L. B.  
MINIMUM LENGTH OF TIME OF FRIGID CONDITIONS IN ANTARCTICA AS DETERMINED BY THERMOLUMINESCENCE. Amer. J. Sci., 262(6): 767-781 incl. graphs, June 1964. 13 refs.  
DLC, Q1.A5

The number of trapped electrons that produces the glow-curve peak of calcite at 230°C is a function of the amount of radioactive impurities, temperature, and time. Laboratory experiments led to the determination of the equations governing the growth and decay of this peak. These show that, for a given sample, when the temperature remains constant the area of the glow-curve peak asymptotically approaches an equilibrium value. The assumption that natural and artificial bombardment produce comparable results is supported by theoretical and experimental evidence. Samples from Antarctica are assumed to have reached equilibrium position during preglacial time under temperate conditions. When glacial conditions set in, the samples ceased to be in equilibrium and the number of trapped electrons increased. The time necessary for the area of the peak to grow from the equilibrium position of preglacial times to the present value is the minimum length of time for frigid conditions in Antarctica. Because the sample could have been deeply buried and later exposed at the surface by glacial erosion, only a minimum limit for the length of time of the glaciations in the area can be calculated. A value of 210,000 years was obtained from samples from the McMurdo Sound area. (Author's abstract)

SIP 22284

551.32(\*50)

Kalesnik, S. V.  
REVIEW OF GLACIOLOGY. (Ocherki glatsiologii; Text in Russian). Moscow, 1963, 551p. incl. illus., tables, diagrs., graphs. [350] refs.  
DLC, Slavic Div.

Present day glaciological science is reviewed, giving a resume and analysis of data obtained, presentation of research methods, and examination of theoretical problems. Chapters are devoted to: ice as a mineral and a rock; snow lines; origin and feeding of glaciers; movement of glaciers; mass ablation and balance in glaciers; advance and retreat of glaciers; development of glaciers; systems and classification of glaciers; transport and accumulation of glaciers; glacial erosion; contemporary glaciation of the Earth; and man and glaciers. The book is written for a wide circle of scientists and principally for physico-geographers, hydrologists and glaciologists. -- ES/FMM

SIP 22285

551.515.8:551.521.3:551.521.12

Nikitskaya, N. I.  
PECULIARITIES OF OPTICAL CHARACTERISTICS OF ARCTIC MASSES OF AIR. (Osobennosti opticheskikh kharakteristik arkticheskikh mass vozdukh; Text in Russian). Trudy Glavnoy Geofiz. Observatorii, No. 118:77-81 incl. table, graph, 1961. 7 refs. (Eng. Transl.: Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, FTD-MT-63-17/1-2, July 12, 1963).  
DLC, QC801.L46

Investigations were made from July to Oct. 1951 of the spectral transparency of the atmosphere in the area of Leningrad, USSR. The characteristics are discussed which distinguish Arctic air from air masses of other origins. An actinometer was used which was furnished with narrow-band interference light filters. High constancy values were observed for the spectral-transparency coefficient of the atmosphere. The optical effect of aerosol diffusion can be considered neutral. -- BLE

SIP 22286

551.466.72:(\*746)

Somov, M. M. and A. V. Koptev  
TIDES IN THE MIRNYI OBSERVATORY REGION. (Priliv y razone observatorii Mirny; Text in Russian). Sovet. Antarkhticheskaya Eksped., Inform. Bull., No. 1:73-78 incl. illus., tables, graphs, 1958. (Eng. transl. in: Soviet Antarctic Expedition, Information Bulletin, Vol. 1, Amsterdam, Elsevier, 1964, p. 46-51).  
DLC, Q113.S686; Q115.S6862

Sea level recordings were obtained in the Mirny region using a "Valdal" recording tide gage from Nov. 22, 1956, to Jan. 9, 1957. The gage assembly is described. The complex nature of the tidal sea level oscillations are explained by the fact that the  $M_2$  semidiurnal waves, and the  $K_1$  and  $O_1$  diurnal waves predominate, the amplitudes of each being about equal. The tide at Mirny is an irregular diurnal tide  $[(H_{K_1} + H_{O_1})/H_{M_2} = 2.34]$  with all the characteristics of that type. The data agree well with the only other recordings ever made in the area (1902). In addition, the values derived for the cotidal times of the semidiurnal  $M_2$  and diurnal  $K_1$  waves fit well into the existing scheme of those for the southern oceans. -- JRT

SIP 22287

551.506.2:551.506.7:(\*7)

Krichak, O. G.  
PRELIMINARY RESULTS OF AEROMETEOROLOGICAL STUDIES FROM 1957/58, (Predvaritel'nye rezul'taty aerometeorologicheskikh rabot v 1957/58 g.; Text in Russian). Sovet. Antarkticheskaya Eksped., Inform. bül., No. 1:57-59, 1958, (Eng. transl. in: Soviet Antarctic Expedition, Information Bulletin, Vol. 1, Amsterdam, Elsevier, 1964, p. 36-38).

DLC, Q115.S686; Q115.S6862

Preliminary conclusions indicate: (1) the Antarctic anticyclone is always present at a height of at least 5 km and sometimes higher; (2) the Antarctic anticyclone and cyclone zones are asymmetrically shifted to conform with the asymmetrical orientation of the continent with respect to the South Pole; (3) the relative proximity of the cyclone zone to the subtropical high pressure belt leads to an increase in the horizontal pressure and to the formation of a jet stream and a frontal zone of increased cyclonic activity; (4) meridional, not zonal, processes predominantly determine the climate, the most intense meridional processes causing the deflection of the mid-latitude jet stream to penetrate the continent accompanied by heat transport to high latitudes and cyclonic penetration; (5) tropospheric jet streams are associated with cyclonic activity, whereas the stratospheric jet streams arise from the contrast in stratosphere temperatures over the sea and land; (6) there is a permanent temperature inversion in the 300-500 m layer above the continent; (7) actinometric results indicate that minimum temperatures in Antarctica may be as low as  $-80^{\circ}\text{C}(\pm 2^{\circ})$ ; and (8) katabatic winds in combination with cyclonic frontal zone activity are capable of removing all snow in the Bunge Hills area, giving rise to snow-free conditions in winter and a relatively warm microclimate in summer. -- JRT

SIP 22288

551.311.5:551.4:(\*7-11)

Voronov, P. S.  
ON THE GEOMORPHOLOGY OF EAST ANTARCTICA. (K geomorfologii Vostochnoi Antarktidy; Text in Russian). Sovet. Antarkticheskaya Eksped., Inform. bül., No. 1:35-39, incl. illus., map, 1958. 3 refs. (Eng. transl. in: Soviet Antarctic Expedition, Information Bulletin, Vol. 1, Amsterdam, Elsevier, 1964, p. 20-24).

DLC, Q115.S686; Q115.S6862

The geomorphological characteristics of the subglacial relief of East Antarctica ( $75^{\circ}$ - $110^{\circ}$  E) are described. A "skerry-type" landscape characterizes the original coastline development as evidenced by the winding bay-fjords and numerous rocky islets. Small rocky hills with flat or slightly convex summits characterize the ice-free land farther inland. Roches moutonnées are common relief forms, and

scars and striations are distinctly evident. The abrasion areas on the sea slopes of the Greason Hills (Windmill Is.) and the Vestfold Hills are true marine terraces. A distinctive characteristic of the coast is the almost total absence of beach development. The marine terraces and saline lakes (ancient fjords cut off by general uplift of the entire region) fix the time of the most recent epeirogenic activity. Glacial denudation is the predominating external factor affecting the relief of this area although evidence of wind, frost, and chemical weathering is also present. The orientation of glacial striations and the calcareous-encrusted ice scars confirm the hypothesis that glaciation occurred in a number of phases interspersed with substantial warming trends. -- JRT

SIP 22289

551.513.2:551.509.318:(\*3+\*7)

Girs, A. A.  
THE INTERRELATION BETWEEN ATMOSPHERIC CIRCULATION IN THE ARCTIC AND ANTARCTIC. (O vzaimosv'язi mezhdu Girkulatsiei atmosfery v Arktike i Antarktike; Text in Russian). Sovet. Antarkticheskaya Eksped., Inform. bül., No. 2:21-24, 1958. 17 refs. (Eng. transl. in: Soviet Antarctic Expedition, Information Bulletin, Vol. 1, Amsterdam, Elsevier, 1964, p. 70-73).

DLC, G115.S686; G115.S6862

A close relationship between atmospheric processes in both hemispheres is indicated by the following: (1) years with severe or light ice in the Arctic were duplicated in the Antarctic; and (2) synoptic processes in the Arctic were shown to be closely associated with the large-scale types of atmospheric circulation in the Northern Hemisphere; a similar situation was found in the Antarctic in relation to the Southern Hemisphere. Thus, it is recognized that processes in the Arctic and Antarctic are related to the larger processes of their respective hemispheres, which in turn, are closely related and have a substantial influence on each other. -- JRT

SIP 22290

551.324.43:551.43:551.337:(\*49/\*41)

Miller, Maynard M.  
MORPHOGENETIC CLASSIFICATION OF PLEISTOCENE GLACIATIONS IN THE ALASKA-CANADA BOUNDARY RANGE. Proc. Amer. Phil. Soc. 108(3): 247-256 incl. illus., table, diagrs., maps, June 22, 1964. 12 refs.

DLC, Q11.P5

The phases of the Pleistocene glaciation in the coastal Cordillera of the Alaska-Canada boundary region are classified and described. In the culminating stage of the Pleistocene Epoch, The Cordilleran Glacier Complex reached its most extensive development at the latitude of the Taku District of the Alaskan Panhandle. It was similar in nature, form, and di-

mension to the present-day Greenland ice cap. In the Taku District, at the maximum stage, the regional ice center was east of the present water divide and probably existed as an elongated zone or broad glacial ridge connecting the highest bedrock massifs. It is probable that at the summit levels (ca. 8000 ft) the direct signs of glaciation earlier than the Wisconsinan have been removed. In the next lesser stage, which is the one most clearly recognized from local evidence in the Boundary Range, some of the nunataks between 6000 and 8000 ft protrude through the ice surface. The latest separate glaciation in the Taku District was much smaller than the earlier Wisconsinan maxima. In this glaciation, ice filled the bottom part of the Taku valley and coalesced with tongues from the tributary valleys. The next phase to be considered is typified in the Taku District by the Alaskan Little Ice Age. The final phase is called the Local Glacier Phase. -- BLE

SIP 22291

551.324.6(\*49)

Miller, Maynard M.  
INVENTORY OF TERMINAL POSITION CHANGES IN ALASKAN COASTAL GLACIERS SINCE THE 1750'S. Proc. Amer. Phil. Soc. 108(3):257-273 incl. illus., tables, graph, maps, June 22, 1964. 40 refs.  
DLC, Q11.P5

Southeastern coastal Alaska is divided into 7 glaciological provinces in which at least 80% of the glaciers in Alaska are located. The Stikine district is extremely mountainous and has all the characteristics of a submerged coast line. The dominant characteristic of these ice masses has been shrinkage with only a few of them near equilibrium. The most impressive geomorphic feature in the Taku District is the extensive network of glaciers which comprise the Juneau Icefield. In the Glacier Bay District a phenomenal disappearance of ice has been observed in recent years. There have been several instances of minor readvances. The Chilkat District comprises a small icefield whose glaciers are thinning and in retreat. In the Lituya Bay District, the glaciers were considerably receded at the end of the eighteenth century while the Glacier Bay ice sheet was at its maximum. The St. Elias District is covered with more than 10,000 mi<sup>2</sup> of ice. Prince William Sound and the Chugach Range District have a regional snowline and mean névé-line which are much lower than elsewhere along the coast. Although many of the small glaciers are in retreat, over the past 60 yr a larger proportion has been advancing in the two latter districts than in the other districts. -- BLE

SIP 22292

551.501:551.578.46:528

Shcherbakova, L. F.  
ANALYSIS OF THE RESULTS OF SNOW MEASURING SURVEYS AND RECOMMENDATIONS FOR IMPROVING THE METHOD OF SNOW COVER OBSERVATIONS. (Analiz rezul'tatov snegomernykh s'emoi i rekomendatsii po uluchsheniū metodiki nablūdeniū nad snezhnym pokrovom; Text in Russian). Snezhnyi pokrov, ego rasprostraneniē i rol' v narodnom khozīstve, Akad. nauk SSSR, p. 5-14 incl. tables, graphs, 1962. 3 refs.  
DLC, GB2403.A544

See SIP 21480:

CONCERNING THE IMPROVEMENT OF SNOW MEASURING OBSERVATIONS. Soviet Hydrology: Selected Papers, No. 1:7-16, 1962.  
DLC, Unbound periodical

SIP 22293

551.501:551.578.46:528(\*533)

Kuznetsov, A. T.  
THE QUESTION OF A METHOD FOR SNOW COVER OBSERVATIONS IN KAZAKHSTAN. (K voprosu o metodike nablūdeniū nad snezhnym pokrovom v Kazakhstane; Text in Russian). Snezhnyi pokrov, ego rasprostraneniē i rol' v narodnom khozīstve, Akad. nauk SSSR, p. 15-19 incl. diagr., map, 1962. 3 refs.  
DLC, GB2403.A544

The coordination of data which characterize the snow cover of Kazakhstan with the results of climatic research shows that the results of snow cover observations at zonal points can be expediently processed by reducing them to the data of reference points. When using the combined method of snow cover observations, the reference and zonal points are linked up on the network of local air routes on which observations are made monthly or at least 3 times a winter. Air-route observations, conducted simultaneously with ground observations at the reference points, provide a reliable idea of the degree to which a territory is covered by snow, and permit an estimate of the mode of occurrence, structure, depth of snow, and the sites of snow and accumulation removal. This combined method permits the results of previous observations to be used by introducing appropriate conversion factors. It also provides opportunities for establishing the relations of snow cover dynamics to the synoptic processes which influence it. Yearly field investigations of the snow cover and the synoptic conditions of its formation and disappearance will be useful in determining a method to predict the individual stages of formation of the snow cover and its characteristics. (RZh, Geofizika abstract, modified)

# CRRRL BIBLIOGRAPHY

SIP 22294

551, 501:551, 578, 46:528(+533)

Prokhorov, I. P.  
STUDY OF SNOW RESERVE CONDITIONS IN KAZAKHSTAN. (K izucheniiu rezhima snegozapasov v kazakhstane; Text in Russian). Snezhnyi pokrov, ego rasprostraneniye i rol' v narodnom khoz'ystve, Akad. nauk SSSR, p. 20-24 incl. tables, graphs, 1962. 4 refs.  
DLC, GB2403, A544

Experiments were conducted in 1956-1958 at 7 points in the northern part of Kazakhstan, USSR, to determine the most rational method for snow measuring observations. It was established that, when the snow-cover depth was measured on stationary and topographic surveys, the snow reserve measurements were almost twice as high. Topographic surveys showed that, around a steppe settlement, a circular zone (with a radius of about 3 km, and reduced snow-cover depth) developed as a result of wind action and other factors. Contemporary methods of measuring snow should be re-examined for several regions in Kazakhstan and they should be supplemented by observations of evaporation and of snow movement during snow storms. Snow-cover evaporation in Kazakhstan is 0.4 mm/day. Evaporation from a rough surface is greater than that from a smooth surface. (RZh, Geofizika abstract, modified)

SIP 22295

551, 578, 46:53(+3)

Kozlov, M. P.  
RESULTS OF DETERMINING SOME MECHANICAL PROPERTIES OF SNOW IN THE ARCTIC. (Rezultaty opredeleniia nekotorykh mekhanicheskikh kharakteristik snega v Arktike; Text in Russian). Snezhnyi pokrov, ego rasprostraneniye i rol' v narodnom khoz'ystve, Akad. nauk SSSR, p. 47-53 incl. tables, graphs, 1962. 5 refs.  
DLC, GB2403, A544

The results are given of measurements made of the temporary resistance of snow to crushing, shearing, rupture, and fracture. From -10° to -20° C this resistance in structurally identical snow increases almost identically with increasing density. The temporary crushing resistance of denser snow rises sharply at lower temperatures. This is explained by the fact that in less dense snow the increased crushing resistance is mainly related to the increased elasticity of the crystals themselves, while in dense snow considerable frictional forces act between the particles. The direction of the stress applied to crush a sample also influences the temporary crushing resistance of snow. Temporary shearing resistance increases linearly as the density of snow increases and the temperature falls. Shearing resistance values are much lower than crushing resistance values; the former are also dependent on the time of formation of the snow cover. The temporary tensile strength of snow increases as density increases because of the decrease in the number of

points of cohesion per unit of area. The temporary resistance of snow to fracture increases markedly with increasing density. (RZh, Geofizika abstract, modified)

SIP 22296

551, 579, 2(+532)

Rutkovskaya, N. V.  
MELTING AND DEAPPEARANCE OF THE SNOW COVER IN THE SOUTH-EAST OF THE WEST SIBERIAN PLAIN. (Tafanie i skhod snezhnogo pokrova na figo-vostoke zapadno-sibirskoi nizmenosti; Text in Russian). Snezhnyi pokrov, ego rasprostraneniye i rol' v narodnom khoz'ystve, Akad. nauk SSSR, p. 104-113 incl. tables, 1962. 12 refs.  
DLC, GB2403, A544

The conditions are discussed under which the snow cover melts in the Novosibirsk and Tomsk regions, the plains of the Altai Territory, and the far north of the Kemerovo region. The thaw period lasts from 50 days in the north to 30-32 days in the south. Caking, temporary thawing, and the impregnation of snow with water occur during the period of snow consolidation which lasts 10 days. During this period the snow density increases considerably and the albedo decreases from 0.7 to 0.4. In the steppe and forest-steppe regions melting begins in the third 10-day period of March under the effect of radiation at -10° to -7° C. Disintegration of the stable snow cover occurs in the first half of April (0-2° C). In the forest zone, melting starts in the first 10-day period of April (-6° to -4° C) and stable snow cover disintegration occurs at the end of April (3° C). The complete disappearance of snow occurs in the second half of April in the south and in the first 10-day period of May in the north. In the steppe and forest-steppe regions the earliest complete disappearance of snow occurs in the second half of the third period of March; in the forest zone it can happen in the first half of April. The latest time when snow disappears in the steppe and forest-steppe regions is at the end of the second period of May and at the beginning of the third. In the forest zone it is at the end of the third period of May and in the first period of June. (RZh, Geofizika abstract, modified)

SIP 22297

624, 139, 22:624, 15(+425)

Adams, J. I.  
FROST HEAVING OF SMALL FOOTINGS. Ontario Hydro. Res. News, 14(4):21-24 incl. illus., table, graph, diagr., 1962. 2 refs.  
DLC, TA1, O6

The results are presented of a study of various methods of preventing the frost heaving of footings, frost action in soil is discussed briefly, and the results of earlier studies are mentioned. Heaving is caused by the formation of pure ice lenses at the

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boundary between the frozen and unfrozen soil. The lenses may range from microscopic thickness to 1/4 in. or more. Most structures are founded below the depth of maximum frost penetration and the heaving that occurs is not associated with the soil on which the footing is founded, but with the grip of the heaving soil on the sides of footing piers. Methods to reduce frost heaving include elimination of the grip of the frozen soil on the sides of a footing pier, enlargement of the footing base, replacement of the soil adjacent to the footing with free-draining material, treatment of the soil by chemical additives, lowering of the ground water by drainage, and insulation of the ground to prevent frost penetration. -- BLE

SIP 22298 551.324:528.4(\*464.4)

Haumann, D.  
SURVEYING GLACIERS ON AXEL HEIBERG ISLAND. Can. Surveyor, 17(2):81-93 incl. illus., tables, graphs, June 1963. 7 refs.  
DLC, TA501.C3

The purpose of the field survey was to establish the basic ground control for measurements and mapping by aerial photography. The signals used were aluminum plates, tripods of aluminum poles, and cairns painted yellow. It is concluded that field equipment should be lightweight and simple, and should permit improvisations and modifications that may be easily carried out in the field. The aerial picture is the most important factor in photogrammetric mapping. Provisional plotting with form lines, presentation of glacier outlines, river courses, morainic debris on glacier and firm ground, etc., are a valuable base for detailed field investigations, even if the scale is known only approximately and the reference zone is tilted considerably in relation to the true horizon. Maps or plans of glaciated areas should contain a precise and complete presentation of features characteristic of the presence of glaciers. The small-scale photography (1:60,000) used for the 1:50,000 mapping proved to be satisfactory for this purpose. -- BLE

SIP 22299 551.324:528.927:655.3(\*464.4)

McKortel, T. A.  
THE REPRODUCTION OF THE THOMPSON GLACIER MAP. Can. Surveyor, 17(2):93-95, June 1963.  
DLC, TA501.C3

This article is a brief description of the methods and techniques used in the production of a multicolor map of the Thompson Glacier region by the Photogrammetric Research Section of the National Research Council of Canada. The first stage employed a combination of negative scribing together with the use of pen, pencil, and airbrush. The second stage involved the use of the peelcoat method of producing

masks for color-separation and the extensive use of half-tone screens to produce the final negatives and printing plates. Initially the plotting manuscript was photographed and a film negative was produced at the drawing scale of 1:40,000. This negative was used to make blue-line prints on a white translucent scribe-coat material. This nonphotographic blue image provides the key for the scribing or drawing of the individual color plates. A detailed description is given of the preparation of the different color plates. -- BLE

SIP 22300 910.3:551.324:528.9(\*464.4)

Müller, Fritz  
AN ARCTIC RESEARCH EXPEDITION AND ITS RELIANCE ON LARGE-SCALE MAPS. Can. Surveyor, 17(2):96-112 incl. illus., tables, graph, diagr., maps, June 1963. 9 refs.  
DLC, TA501.C3

This article discusses the McGill University's Arctic Research Expedition to Axel Heiberg Island in 1959. The expedition concentrated on an intensive study of 1 defined area of the island, for which precise large-scale maps (1:50,000 to 1:5,000) are necessary. The work of the expedition is divided into 2 parts: the gathering of field data in the summer, and its processing during the winter. Included in the discussion are the preliminary contributions of aerial photogrammetry, the cartographic requirements of the various sciences (geology, geomorphology, botany, gravimetry, and glaciology). One of the prime objectives of the expedition was to make detailed mass-balance studies of a typical glacier in the Queen Elizabeth Islands during several consecutive years. This work is described, and data and information are given on the ablation of the White Glacier, the accumulation area of a high Arctic glacier, comparisons of budget years and climate during the field seasons in the area, changes in snow positions of typical glaciers, glacier-dammed lakes, and ice-surface structures. -- BLE

SIP 22301 551.324.43/.5:528.7(\*464.4)

Blachut, T. J.  
PHOTOGRAMMETRIC DETERMINATION OF GLACIER MOVEMENT, RATE OF ABLATION, AND PROFILES. Can. Surveyor, 17(2):112-122 incl. illus., tables, graphs, diagrs., June 1963.  
DLC, TA501.C3

In connection with the glaciological expeditions to Axel Heiberg Island, photographic flights were planned for large-scale mapping of various glaciers and for the determination of ice movement and ablation rate. The position of clearly identifiable points along the profile line was measured in a stereo model from the first photographic flight; the same measurements were repeated in a convenient stereo model

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from the second flight; and both measurements were tied into points on solid ground close to both ends of the profile line. The horizontal components represent the glacier movement, whereas the vertical component depends partly upon the horizontal movement of the glacier and partly upon the ablation. The horizontal velocity can be computed by dividing the total horizontal displacement by the time interval between the first and second set of photographs. Ablation rate can be computed from the velocity measurements if the elevation of each point is measured for each flight, and the slope of the ice surface is either established at the same time or determined from a large-scale map. Longitudinal and cross profiles can be produced photogrammetrically with little additional effort once the photographs and the basic ground control are available. In quantitative studies of glacier changes, especially where many glaciers are involved, the profiles could be used instead of the successive mapping. -- BLE

a number of years the budget state of the Galindez Island ice cap is one of equilibrium with minor oscillations in surface level related approximately to the cyclic variations in the annual mean temperature. Surface movement over the ice cap is negligible except in the ice adjacent to the southern ice cliffs. This active ice receives a high net accumulation of snow which is balanced by forward movement and periodic calving at the ice cliffs. It is suggested that the surface movement observed is caused by plastic deformation of the underlying ice which is possibly warmed by geothermal heat and heat received from the sea. The possibility of bottom sliding is examined and it is considered unlikely to be the only mechanism involved. A map of Galindez Island shows exposed rock in Dec. 1956, snow contours at 5-m intervals in March 1961, major crevasses, positions at which snow temperatures were measured, stake positions, annual surface movement, and the distribution of net accumulation during the two budget years March 1961-March 1963. (Author's abstract, modified)

SIP 22302

629.124.75:527:(\*7)

Morley, J. P.

POLAR SHIPS AND NAVIGATION IN THE ANTARCTIC. Brit. Antarctic Survey Bull. No. 2:1-25 incl. illus., tables, diagrs., Dec. 1963. 128 refs. DLC, Unbound periodical

A brief survey is presented of the history of the development of icebreakers and ice-strengthened ships. The characteristic features of modern polar ships are described and exemplified by the icebreaker Moskva and the ice-strengthened ship Nella Dan. Ships used by the British Antarctic Survey are also described. Specifications are tabulated for all ships. Navigation and ice pilotage in the Antarctic are described and an account is given of the procedures followed under various conditions. The usefulness of icebreakers in support of Antarctic expeditions is emphasized. The two-part bibliography lists references under the headings Polar Ships and Polar Navigation. (Author's abstract, modified)

SIP 22303

551.324.2:(\*726.54)

Thomas, R. H.

STUDIES ON THE ICE CAP OF GALINDEZ ISLAND, ARGENTINE ISLANDS. Brit. Antarctic Survey Bull. No. 2:27-43 incl. illus., tables, graphs, diagrs., map, Dec. 1963. 1 ref.

DLC, Unbound periodical

Most of the Argentine Islands support ice caps which are considerably larger than would be expected to exist on such small islands. These are thought to be relics of the former coastal ice shelf, which are nourished by large accumulations of drift snow; this is a consequence of the prevailing NNE wind combined with high rocky cliffs above the northern coasts which act as drift obstacles. It is deduced that over

SIP 22304

551.578.46:(\*729.5)

Limbirt, D. W. S.

THE SNOW ACCUMULATION BUDGET AT HALLEY BAY IN 1959, AND ASSOCIATED METEOROLOGICAL FACTORS. Brit. Antarctic Survey Bull. No. 2:73-92 incl. tables, graphs, map, Dec. 1963. 15 refs.

DLC, Unbound periodical

Frequent measurements at three different stake patterns covering disproportionate areas of the Brunt Ice Shelf near Halley Bay Station were used to study daily, monthly and annual accumulation, and local variation in accumulation. A study of pit stratigraphy, daily accumulation measurements and changes in snow density gave an estimate of settling of -19 cm, which was half the apparent ablation loss. The effects of evaporation at the surface (4.1 g of water), evaporation of drift snow in flight (2.9 g of water) and drift snow losses by wastage out to sea (4.5 g of water) are discussed in relation to the true ablation loss. True ablation losses amounted to about one-quarter of the measured gross accumulation, which is about one-third of the net annual accumulation. (Author's abstract, modified)

SIP 22305

69.033.001.4(\*2)

Sherwood, G. E.

PIONEER POLAR STRUCTURES -- PORTABLE MAINTENANCE SHELTER. U. S. Naval Civil Eng. Lab., Proj. Y-F015-11-01-143, Tech. Rept. R-317, Type C, Final Rept., 25p. incl. illus., tables, diagrs., appendixes A-B, June 22, 1964. 6 refs. DLC, Tech. Rept. Collection

The need for adequate shelter for maintenance and

# CRREL BIBLIOGRAPHY

repair of construction and other equipment in pioneer polar camps resulted in the development of a packaged maintenance shelter. The shelter, a canvas-covered, aluminum-frame structure, was developed by NCEL. It is skid-mounted for easy portability around a work area. The 20- by 24-ft shelter is adequate for the repair and maintenance of equipment as large as a Size 2 snow tractor and a Size 4 standard tractor. A standard NCEL portable wanigan was outfitted with shop equipment and tools as a companion piece for the shelter. A prototype shelter was evaluated near McMurdo Station. It was concluded from the test that the shelter and its outfitting is well suited for the maintenance and repair of equipment at pioneer polar camps and that it should be included as a facility for such camps. (Author's abstract, modified)

SIP 22306

551,508,953:581,5

Finley, Virginia P.  
PHOTO-INTERPRETATION OF VEGETATION.  
Tech. Rept. 69, U. S. Army Snow and Permafrost Research Establishment, 36p., appendixes A-E, July 1960. 265 refs.  
SIPRE files

The results of a study on the applicability, capabilities, and limitations of existing airphoto interpretation techniques in determining certain physical properties of vegetation, which is based on a survey of the literature published since 1948, are reported. The interpretation of tree and scrub stands is emphasized with special attention given to measurements of trunk diameter and spacing, canopy height and coverage, density and height of undergrowth, and type of foliage. The accuracy of measurements are examined with respect to scale, photo characteristics, seasonal effects, and light conditions. Photographic factors affecting vegetation images, vegetation characteristics obtainable from aerial photographs, and vegetation identification and its significance as an indication of terrain conditions are discussed. The appendixes contain information relative to type of photography, instrumentation, species identification, physical characteristics of vegetation, and vegetative keys used in the various literature sources studied. (Author's abstract)

SIP 22307

016:551.32/34-551.578,4

Cold Regions Research and Engineering Laboratory  
BIBLIOGRAPHY ON SNOW, ICE AND PERMAFROST WITH ABSTRACTS. CUMULATIVE INDEX, VOLS. I-XVII. CRREL Rept. 12, 256p., June 1964.  
CRREL files

This cumulative index covers SIPRE and CRREL abstracts 1 to 21,000 which have been published in 17 volumes. The 4 parts of the work, author, title, patent, and subject indexes supersede the cumulative

indexes published in 1955 and 1956. The author index lists the authors of all abstracts produced to June 1963. The title index identifies papers in the above series for which the authors are unidentified. The patent index is a listing by subject of all patents abstracted. The subject index consists of approximately 4,000 subject headings and cross references, and serves as the subject control for the CRREL Bibliography Project, in addition to its function as a retrieval tool for the reader. The subject coverage for the needs of CRREL and other users is further classified by using topical and geographic subdivisions for the headings. The use of some topics as sub-divisions of other topics has been indicated and cross-referenced as necessary. (From the introduction)

SIP 22308

551,322:548,51:546,26

Garten, V. A. and R. B. Head  
CARBON PARTICLES AND ICE NUCLEATION.  
Nature, 201(4924):1091-1092 incl. illus., table, diagr., March 14, 1964. 11 refs.  
DLC, Q1.N2

Work on various types of organic nucleators has shown that activity above -20° C depends on the presence of hydrogen-bonding groups and their disposition, on particle size, and on the degree of crystallinity. Accordingly, pure hydrocarbons and hydrogenated graphites show no activity; however, as soon as surface oxidation occurs by exposure to air or by treatment with oxidizing agents, some activity begins to appear. Attempts were made to control these factors in carbonaceous materials by variations in heat treatment and oxidation procedure. Typical results obtained in these experiments are compared with those obtained from observations with highly active powdered organic nucleators of well-known crystal structure. Carbonaceous particles always show activities several orders of magnitude lower than the best organic nucleators. Some highly active batches were obtained by treatment with  $\text{KMnO}_4$ ,  $\text{H}_2\text{O}_2$ ,  $\text{H}_2\text{O}_2 - \text{FeCl}_3$ , and  $\text{H}_2\text{O}_2$  under ultraviolet light, but reproducibility was poor. Oxidation with potassium permanganate proved extremely difficult to control and high activity was only rarely obtained. Crushing alone also produced increased nucleative activity in certain chars containing non-peripheral oxygen atoms such as sugar chars. In general, very high activities cannot be obtained with graphites and chars whatever their source or treatment. The very low activity of diamond dust, as observed on the cold stage, might be explained by the absence of a reasonable fit between the ice lattice and its close-packed planes. -- BLE

# CARREL BIBLIOGRAPHY

SIP 22309

581.5:551.34(78)

Johnson, Philip L. and W. D. Billings  
THE ALPINE VEGETATION OF THE BEARTOOTH  
PLATEAU IN RELATION TO CRYOPEDOGENIC  
PROCESSES AND PATTERNS. Ecol. Monographs,  
32:105-135 incl. illus., tables, diagrs., maps,  
Spring 1962. 57 refs.  
DLC, QH98.G73

The major alpine plant communities and environments on the Beartooth Plateau of Wyoming and Montana are described, and the patterned ground features are discussed in relation to soil frost action and vegetation. The relationships are evaluated between vegetation, snow cover, and cryopedogenic processes. A point quadrat technique of sampling was used whereby the quadrat is reduced to an infinitely small size, i.e., a point, above which the presence or absence of a species is recorded. Four main vegetation types (*Geum* turf, *Deschampsia* meadow, *Carex scopulorum* bog, and *Salix* thicket) were found which intergrade with each other along environmental gradients. To evaluate the degree of frost action, stakes were placed in several frost boils and hummocks which appeared active. Pressurized paint cans were used to spray spot medallions on the surfaces of bare polygons and to mark lines across sorted stripes and nets. Disruption of these paint marks would suggest active frost-caused movement. The dynamic nature of soil frost action is indicated by the abundance of cryopedogenic features which appear to have continued activity. Frost boils remain bare of vegetation, gray silt is exposed in polygon centers which are bordered by lichen-free rocks, and sod chunks fall away from the faces of solifluction terraces. During the summer, needle ice formation occurs below 30° C whereby rock particles are lifted as much as 2 in. off the slope. -- BLE

recordings in order to understand how the under-ice noise differed from normally distributed noise), and (5) a summary of pressure-spectrum measurements which were made on 3 separate expeditions. -- BLE

SIP 22311

629.12.037:629.124.75

Ignat'ev, M. A.  
CALCULATING THE STRENGTH OF SCREW PROPELLER BLADES FOR SHIPS USED IN ICE NAVIGATION. (Raschet prochnosti lopastei grebnykh vintov sudov ledovogo plavaniia; Text in Russian). Problemy Arktiki i Antarktiki, Vyp. 16:75-82 incl. tables, diagrs., 1964. (Eng. transl: Office of Tech. Services, U. S. Department of Commerce, Washington, D. C., TT:64-41207, Aug. 14, 1964).  
DLC, G575.L422

The magnitude of an ice load on the blades of a screw propeller during their interaction with ice depends on factors such as ice thickness and strength, the position of the ice floe with respect to the screw, its dimensions, the number of revolutions of the screw propeller, and the speed of the vessel. In this investigation, a screw propeller is considered as a cantilever fastened on a base with the radius  $R_1$  and subject to the action of axial, circumferential, and ice loads. Formulas are derived on the basis of theoretical and experimental investigations which can be used to calculate the strength of screw-propeller blades. Design specifications are tabulated for the screw propellers of 6 ice breakers. -- BLE

SIP 22310

534.61:551.463.288(\*60)

Greene, Charles R. and Beaumont M. Buck  
ARCTIC OCEAN AMBIENT NOISE. J. Acoustical Soc. Amer., 36(6):1218-1220 incl. graphs, June 1964. 2 refs.  
DLC, QC221.A4

Directional, spectral, and statistical properties of the under-ice noise in the Arctic are presented. The measurements were made during a 15-day period on an ice floe in the Beaufort Basin in April 1963. The plotted data include (1) the average pressure-spectrum level of the ambient noise from 25 to 1000 cps as received by a hydrophone 200 ft below the surface over a two-week period, (2) spectrum level vs. time, (3) polarity correlation (to determine if the ambient noise were anisotropic), noise direction, and wind speed vs. time, (4) probability density functions (obtained by analyzing samples of the ambient-noise

SIP 22312

551.322:535.32

Horton, George W.  
INDEX OF REFRACTION OF ICE. Amer. J. Phys. 32(4):320, April 1964.  
DLC, QC1.A47

Ice lenses were made by placing 2 watch glasses together in the form of a double convex lens. Then they were immersed in boiling water (to remove much of the air) and subsequently frozen in a freezer. When the outside ice is removed, an ice lens remains. The values of the refractive index of ice (obtained from the lens maker's formula) ranged from 1.29 to 1.36. The critical part of the determination is the measurement of the focal length which must be accomplished rapidly. The frosty outer layer is removed with the palm of the hand. -- BLE



SIP 22313

551, 578, 7:574, 23:662, 237

List, Roland  
ON THE EFFECT OF EXPLOSION WAVES ON HAIL-  
STONE MODELS. J. Appl. Meteorol. 2(4):494-497  
incl. illus., table, Aug. 1963. 6 refs.  
DLC, QC851.A66

Four series of experiments were conducted in order to evaluate the conclusion obtained by Vittori (1960) that blast waves are capable of breaking up watery hailstones up to a distance of 150 m from the point of explosion. The tests objects were obtained by (1) casting hollow-ice hemispheres (external diam. 4 cm, internal diam. 1.5 cm) filled with ethylenedichloride and sticking them together in pairs with freezing water, (2) using snowballs (5.0 cm to 6.5 cm in diam. in the second experiment and smaller ones in the third), and (3) growing ice particles (2 cm in diam.) in a hail tunnel. The blast area was concave in order to avoid impairment of the blast wave by nearby ground. The test objects were hung on fine threads various distances from the explosive charge. The results showed no effect on the objects that could be attributed to the explosion of 1 kg of TNT at distances of 5 m and more from the explosive charge. Therefore, no justification is given for attempting to combat hail by mechanical softening of the hailstones in the immediate proximity of exploding rockets. -- BLE

SIP 22314

551, 578, 71

Braham, Roscoe R., Jr.  
SOME MEASUREMENTS OF SNOW PELLET BULK-  
DENSITIES. J. Appl. Meteorol. 2(4):498-500 incl.  
tables, Aug. 1963. 7 refs.  
DLC, QC851.A66

This paper describes observations made on Project Whitetop of the time and place of occurrence of solid hydrometeors in summer cumulus clouds, and presents the results of bulk-density measurements on some of these particles as they were found inside the clouds. The clouds were flown through with an airplane instrumented for measuring cloud and free-air parameters. Solid hydrometeors (mostly snow and ice pellets) were detected on 125 of the 400 traverses. These samples were collected, examined, and, in many cases, replicated. It appears that the formation of ice pellets is limited to a region near the tops of the most active updraft cores. Density measurements were made on a total of 119 pellets collected on four flights during July and Aug. 1962. These pellets were collected with a twin-Beech D18 which had no cabin insulation or heat, and was flown with the cockpit windows open. A 3-1/2-in. sampling tube permitted outside air to flow directly into the cabin. The densities ranged from 0.87 gm/cc to 0.91 gm/cc. -- BLE

SIP 22315

551, 593, 1:551, 578, 46

Ryznar, Edward  
VISUAL RESOLUTION AND OPTICAL SCINTILLA-  
TION IN STABLE STRATIFICATION OVER SNOW.  
J. Appl. Meteorol. 2(4):526-530 incl. illus.,  
graphs, Aug. 1963. 7 refs.  
DLC, QC851.A66

Optical scintillation, visual resolution, and wind and temperature profiles were measured simultaneously in the same horizontal optical path. The information obtained enabled studies to be made of (1) the intensity and frequency characteristics of optical scintillation in relation to atmospheric turbulence, and (2) resolution conditions in such a way as to contribute to their predictability for various meteorological conditions. The intensity of apparent brightness fluctuations of a DC light source 1.5 m above snow was measured by a telephotometer at the same height 543 m away. The fluctuations were measured in terms of the percent modulation of the received signal, defined as the ratio of the mean peak to peak amplitude of an AC component of the signal to the average, or DC level. Wind and temperature profiles and wind direction were measured continuously throughout all periods of scintillation measurement. A Landolt broken-ring resolution chart was used to determine an observer's visual resolution capabilities. The deterioration in visual resolution caused by shimmer was most pronounced when the atmosphere was clear, a time when the detection and recognition of distant objects were otherwise unimpeded. Visual resolution deteriorated and scintillation intensity increased systematically with increasing inversion magnitude in turbulent flow. Resolution was best in windy and cloudy conditions and poorest on clear nights with light wind speeds. BLE

SIP 22316

551, 326, 23:624, 145, 8(\*50)

Nezhikovskiy, R. A.  
COMPUTATIONS AND PREDICTIONS OF SLUSH  
AND ICE FLOW DURING THE FREEZING PERIOD  
OF RIVERS. (Raschety i prognozy stoka shuga i l'da  
v period zamernaniya rek; Text in Russian). Trudy  
Gos. Gidrol. Inst. (Leningrad), Vyp. 103:3-40 incl.  
tables, graphs, 1963. 23 refs. (Eng. transl.:  
Office of Tech. Services, U. S. Department of  
Commerce, Washington, D. C., TT:64-41256, Aug.  
19, 1964).  
DLC, GB651.L36

The composition and accuracy are analyzed of data concerning flow rates of slush and ice, and a method is proposed for calculating the flow of slush and ice in volumetric and weight units in the absence of full-scale measurements. The objects of the investigation are rivers which freeze by the successive move-

ment of the ice edge upstream. The quantity and physico-mechanical properties of ice material which is carried by the current toward the ice edge are significant in calculations and forecasts of ice jams. Available observations of flow rates of slush and ice have a low accuracy (20-25%) which is caused by random observation errors, differences in measurement methods, and non-uniformity of instrument designs. Flow rate is calculated as the product of 4 co-multipliers: (1) the width of the river between shore ice, (2) motion velocity of the slush and ice, (3) the cover factor, and (4) the thickness of the ice formations. The latter two are calculated with a consideration of the fact that as they move downstream it is not only the degree of cover that increases, but also the thickness of the ice formations and the density of the slush. -- BLE

SIP 22317 551.326.83:551.321.7/.82:539.3

Berdennikov, V. P.  
ON THE MECHANISM OF ICE-COVER SHIFTS. (O mekhanizme podvizhek ledyanogo pokrova; Text in Russian). Trudy Gos. Gidrol. Inst. (Leningrad), Vyp. 103:41-56 incl. illus., table, graphs, diagrs., 1963. 10 refs. (Eng. transl.: Office of Tech. Services, U. S. Department of Commerce, Washington, D. C., TT:64-41256, Aug. 19, 1964). Also: Soviet Hydrology: Selected Papers, No. 2:144-155, 1963.  
DLC, GB651.L38

The periodical shifts of an ice cover were investigated in analogy with a mechanical model which consists of a spring and piston and is described. Ice gorges in rivers (which are emphasized in this report) are caused most frequently by the predominating value of the ice-cover resistance in the initial stage of its opening in one section and the pressure of the moving masses of ice and water. The weakening of the ice cover resistance is caused by various stresses and strains acting on it from the outside. This weakening is accompanied by an increase in water-flow pressure and water level. The latter decreases the strength of the ice-cover connection with the banks. An analysis of the behavior of the mechanical system, which is analogous to the mechanism of ice-cover shifts, indicates the presence of a periodic interrupted motion. This is confirmed by the results of snow-cover compression and shear experiments. Suggestions are given for further investigations. -- BLE

SIP 22318

551.326.83(+533)

Chizhov, A. N.  
ON SOME TYPES OF MOUNTAIN RIVER ICE REGIMES. (O nekotorykh tipakh ledovogo rezhima gornyykh rek; Text in Russian). Trudy Gos. Gidrol. Inst. (Leningrad), Vyp. 103:57-69 incl. illus., table, graphs, 1963. 5 refs. (Eng. transl.: Office of Tech. Services, U. S. Department of Commerce, Washington, D. C., TT:64-41256, August 19, 1964).  
DLC, GB651.L38

This article discusses ice formation on mountain rivers in Soviet Central Asia, and the possibility of a quantitative or qualitative consideration of the factors involved. The ice regime of the sections of mountain rivers can be divided into 3 groups: (1) freezing over, (2) ice layer-ice jam (an ice cover consisting of ice layers and ice jams), and (3) slush flow. An ice regime of the first group, characterized by a process of ice formation proper to valley rivers, is observed in mountain regions on a limited number of water flows. An ice regime of the second group, and especially of the third group, is characteristic of the overwhelming majority of mountain rivers. The features of the ice regimes are subdivided into 8 types. It is concluded that ice complexes observed on mountain rivers are caused by a combination of ice-forming factors which makes it possible to obtain by indirect criteria (hydrological and climatic characteristics of the river section) a tentative concept of the ice regime of the unstudied section of a mountain river, and to forecast the future ice regime of the rivers. -- BLE

SIP 22319

551.326.8(+50)

Molchanov, I. V.  
THE RELATIONSHIP OF ICE-PHASE DATES ON SOME LAKES AND RIVERS IN THE WESTERN USSR. (Sootnoshenie dat ledovykh faz na nekotorykh ozerakh i rekakh zapadnoi chasti SSSR; Text in Russian). Trudy Gos. Gidrol. Inst. (Leningrad), Vyp. 85:52-68 incl. tables, graphs, 1962. (Eng. transl.: Office of Tech. Services, U. S. Dept. of Commerce, Washington, D. C., TT:64-41146, Aug. 12, 1964).  
DLC, GB651.L38

From data obtained from 1881 to 1945, simultaneous periods were selected of the operation of lake and river stations with a variation in these periods of 5 yr or more. The ice-phase dates at a lake station were compared with similar dates recorded at 3, or more rarely 2, of the nearest river stations. The average date of freezing and ice formation on the lakes falls in Nov. for most of them. The lakes are clear of ice at the end of May or the beginning of June in the north, at the end of April or in the first 10-day period of May in the central zone, and in the second 10-day period of April in the south. The ice-phase divergence lies between 0 and 100 days or more, and is determined by the variation in the features of lakes and rivers, the properties and

conditions of the basin in different types of weather, and the heterogeneity of the effects of meteorological conditions. Ice-phase convergence is not a natural property of the ice regime of rivers and lakes; therefore, in the absence of ice on the lake, there is no basis for using ice-phase dates of nearby rivers as an objective analog to determine ice-phase dates of a lake. Local weather phenomena which influence icing include wind direction and velocity, air temperature, cloud cover, and air humidity. -- BLE

SIP 22320

551.579.2:551.521:535.23(5)

Shul'ts, V. L.

ON THE QUESTION OF THE EXPEDIENCY OF ARTIFICIAL INTENSIFICATION OF THE MELTING OF SNOW IN THE MOUNTAINS OF CENTRAL ASIA. Soviet Hydrology: Selected Papers, No. 3:275-278 incl. tables, 1963. 5 refs.

DLC, Unbound periodical

Calculations are presented to demonstrate the uselessness of attempts to accelerate the melting of snow and ice by blackening their surfaces. Since blackening reduces the reflective capacity of the snow, it is effective only in the presence of direct sunlight. Calculations were made of the effect of blackening in July at heights of 3000, 4000, 4500, and 4700 m under the assumption that snow melting occurred only under the influence of solar radiation; all days were clear, and the blackening was maintained for the entire month. The blackening process is technically and economically inexpedient. This does not mean, however, that the search for a method to regulate glacial runoff is useless. -- BLE

SIP 22321

551.324.433

Kononov, V. G.

A METHOD OF MEASURING ABLATION OF A GLACIER. Soviet Hydrology: Selected Papers, No. 2:201-204 incl. tables, graph, diag., 1963. 2 refs.

DLC, Unbound periodical

This method is based on the assumption that in the daily decrease of glacier ice (melting plus evaporation) during the ablation period, the evaporation is extremely small and cannot be compared with the melting. Therefore, ablation determinations by means of stakes are inaccurate. For this method, a representative section of the glacier with a slope not greater than 5-6° is selected near the area where the gradient-balance measurements are made. The surface area (10-20 m<sup>2</sup>) is bounded by little channels. The ice surface outside the bounded area is covered with a 5-8 cm layer of moraine to prevent

the flow of outside meltwater into the bounded area. To collect the water, a vertical wall is chopped in the ice and a small platform is made for the installation of the measuring tank. Density determinations are made by the hydrostatic weighing of the ice in warm kerosene. The latter is poured into a graduated cylinder and an ice sample is put in it. A formula is given for calculating density from the volume increase. -- BLE

SIP 22322

551.326.03:551.326.83(282.251)

Savchenkova, E. I.

10-15 DAY FORECASTS OF DATES OF APPEARANCE OF ICE (BY EXAMPLE OF THE OB' RIVER). Soviet Hydrology: Selected Papers, No. 1:85-88 incl. table, graph, 1963. 1 ref.

DLC, Unbound periodical

A method is proposed of forecasting ice occurrence 10-15 days in advance on the Ob' River between Novosibirsk and Kondinskoye. The most characteristic synoptic process on the Ob' 10-15 days prior to the appearance of ice is the inflow of cold air masses along the periphery of the anticyclones which move from the Barents or Kara Sea into Western Siberia or in the rear of cyclones which pass from the west to the east through the central region of Western Siberia. In addition to the air temperature for the preceding period, water temperature is also important in estimating the occurrence of ice. A prognostic equation is obtained which has 4 variables: air temperature at 2 points (in the north and northeast of the basin under consideration) and temperature and water level at a point upstream. The solution of this problem by the statistical method (whereby empirical influence functions are used) is divided into 3 parts: (1) the selection of the type of functional equation, (2) computation of the empirical influence coefficients, and (3) preparation of the forecast of dates of appearance of ice. -- BLE

SIP 22323

551.33(234.42)

Luknia, Michal

THE COURSE OF THE LAST GLACIATION OF THE WESTERN CARPATHIANS IN RELATION TO THE ALPS, TO THE GLACIATION OF NORTHERN EUROPE, AND TO THE DIVISION OF THE CENTRAL-EUROPEAN WÜRM INTO PERIODS. Geografický časopis (Bratislava), 16(2):127-139 incl. illus., tables, maps, 1964. 46 refs.

DLC, G1.G312

Past studies are reviewed, the area is described, and the course of the Last Glaciation in the Tatra and Lower Tatra is traced. The unsolved question, whether there are traces of one glaciation or several in the Tatra, is discussed and the different findings of several investigators are summarized. The eastern half of the Tatra (High Tatra) is a most suitable area for solving the problems of dividing

the Last Glaciation into periods by studying glacial and fluvioglacial forms. The valleys of the northern slope of the High Tatra are cut more deeply. The cirques are situated 1700-1750 m above sea level. The southern slope of the High Tatra had a larger glaciated area than the northern slope, although the snow line of the former is higher. There were 35 glaciers and firn basins in the High Tatra. In the terminal moraines of the Last Tatra-Glaciation on the southern slope and the piedmont plain, four oscillations of a stadial nature may be distinguished according to the divergence of marginal moraines. These moraines are preserved in the Javorova dolina valley 1280-1500 m above sea level. The relation of the division of the Würm in the Alps, Northern Europe, Central Europe, and the Tatra is illustrated by a stratigraphic table. The table presupposes that all the moraines with well developed morainic topography in the Tatra are from the Last Glaciation. -- BLE

SIP 22325

551.324.3+.41

Weertman, J.  
PROFILE AND HEAT BALANCE AT THE BOTTOM SURFACE OF AN ICE SHEET FRINGED BY MOUNTAIN RANGES. Res. Rept. 134, U. S. Army Cold Regions Research and Engineering Laboratory, 7p. inc. diagrs., May 1964. 10 refs.  
CEREL files

The profile of an ice sheet surrounded by mountains is calculated and, by means of heat balance considerations, the pressure melting point conditions of the bottom ice are examined. A circular ice sheet and an ice sheet which is infinitely long in one direction are considered. The approximate profile of the whole ice sheet is obtained by adding the profiles calculated for 3 regions: an outer glacier, drainage basin on the ice sheet at the head of each outlet glacier, and from the center of the ice cap to the drainage region of each outlet glacier. The fact that the heat lost down the temperature gradient is of the same order as the geothermal heat and the heat of sliding, makes it difficult to determine whether or not the bottom of the ice sheet is at the melting point at a particular location, causing uncertainty in profile calculation. It is concluded that the profile of an ice sheet is little influenced by the presence of encircling mountains, and that the bottom temperature of immature outlet glaciers ordinarily should be at the pressure melting point, thus enabling such glaciers to erode their beds. (Author's abstract)

SIP 22324

551.24:084.3/.4(+3)

Atlasov, I. P. and others  
A NEW TECTONIC CHART OF THE ARCTIC.  
(Novaya tektonicheskaya karta Arktiki; Text in Russian). Doklady Akad. Nauk SSSR, 156(6):1341-1342 incl. map, 1964. (Eng. transl.: Defence Res. Board (Can.), T 412 R, Aug. 1964).  
DLC, AS262, S3663

A new tectonic chart of the Arctic was compiled on the basis of a combination of the historico-genetic and the morphological principles. Much of the data was gathered in 1963. The chart shows structural complexes, stratigraphic levels, and sublevels of different ages, formed under different tectonic conditions. For the first time, the tectonic structures of the continent, the continental shelf, and the ocean floor are depicted in terms of a single system of conventional signs and in closely detailed contours. The area which consists of continental-type crust is divided into fold systems, recent geosynclines, and parageosynclines, each of which are also subdivided. In regions with crust of oceanic and transitional type, the chart shows tectono-magnetic neostuctures which consist of mid-oceanic ridges, oceanic depressions and troughs, island arcs, and oceanic trenches (which form the present-day young geosynclines). These are zones of active andesite volcanism, regional low-angle overthrusts, and deep-focus earthquakes. -- BLE

SIP 22326

551.322:541.128

Butler, Anthony R. and Thomas C. Bruce  
CATALYSIS IN WATER AND ICE. J. Amer. Chem. Soc. 86(3):313-319 incl. tables, graphs, Feb. 5, 1964. 34 refs.  
DLC, QD1.A5

Following reports of great increases in the rates of several reactions in ice as compared to water, the rates of a series of reactions in ice were investigated at -10° C. The reactions investigated included various types (spontaneous, acid, base, etc.) of hydrolysis of acetic anhydride,  $\beta$ -propiolactone, and *p*-butyrolactone acetate, and the specific-acid catalyzed dehydration of 5-hydroxy-6-hydroxydeoxyuridine. The spontaneous reactions were greatly depressed in ice as compared to water. Increases in ionic strength greatly increased the spontaneous rates in ice (up to a critical concentration) and slightly decreased the rates in water. The rate constants for the bimolecular reactions were slightly or greatly enhanced in ice as compared to water (OH<sup>-</sup> catalysis could not be evaluated quantitatively in ice). Increase in ionic strength generally decreased the rates of the bimolecular reactions in ice. It is concluded that a concentration phenomenon, combined with the limiting of the water rate concentration, is responsible for the magnitude of the rate constants obtained in ice. (Authors' abstract, modified)

SIP 22327

624, 143, 8:629, 139, 5

Englin, B. A. and others  
PREVENTION OF ICE CRYSTAL FORMATION IN  
AVIATION FUELS. (Predotvrashchenie obrazovaniya  
kristallov l'da v aviaatsionnykh toplivakh; Text in Rus-  
sian). Khimiya i Tekhnologiya Topliv i Masel, No.  
12:50-55 incl. tables, graphs, 1963. 14 refs.  
DLC, TP315, K44

A study has been made of the effectiveness of cellosolve (GOST 8313-60) as an antifreeze additive for T-1 and TS-1 jet fuels and B-95/130 aviation gasoline. Previous tests showed that of 100 compounds tested, cellosolve is the most effective. In studying the ice formation in the fuels in the presence of cellosolve, the following conditions were varied: temperature (down to -60°C), moisture content (0-0.15%), cellosolve content (0-0.3%), ambient relative humidity, and storage time in the laboratory, in the ground, and in flight. Under all the conditions studied, the addition of 0.3% cellosolve completely prevented the formation of ice in the fuels. Cellosolve had no negative effect on either the physicochemical properties or the performance characteristics of the fuels. Moisture absorption in storage at 30-100% relative humidity was studied in a 1-yr test with T-1, TS-1, and B-95/130 fuel samples with and without 0.3% cellosolve. The moisture content of the samples with cellosolve remained nearly the same as that of the controls. (ATD abstract, modified)

SIP 22328

551, 345:576, 8\*(531, 71)

Perlovskaya, M. I.  
BACTERIAL SELF-DECONTAMINATION OF SOIL  
IN THE FAR NORTH. (Bakterial'noe samoochish-  
chenie pochvy v usloviyakh kraynego severa; Text in  
Russian). Gigiena i Sanitariya, No. 3:97-99 incl.  
tables, March 1964. 5 refs. (Eng. transl.: Office  
of Tech. Services, U. S. Dept. of Commerce, Wash.  
25, D. C., OTS-64-31435, June 8, 1964).  
DLC, RA421, G5

Observations were made of the rate of bacterial self-decontamination of soil in Vorkuta (a perennial permafrost region in the USSR) during the summers of 1959 and 1960. The soil of the experimental field is podsolich-sandy loam and consists of uncultivated tundra. The field was plowed to a depth of up to 20 cm (the agronomically active layer) and separated into 2 sections, the first of which was divided into 3 lots which were covered with liquid waste material at the rate of 200, 100, and 50 tons/ha, respectively. The second section served as the control lot. The data indicate that the introduction of waste material caused an initial increase in bacteria of the coliform group and in the total number of bacteria. In subsequent periods of observation a gradual reduction in the number of bacteria was noted. Data are given on the effect of cultivating, sowing, and low temperatures had on the soil bacterial and microfloral

counts. It is concluded that the soil method of neutralizing liquid waste material in areas of perennial permafrost during the summer months may prove to be adequately effective; this will make it possible to neutralize large masses of organic contaminations with their simultaneous use as fertilizers on agricultural fields. -- BLE

SIP 22329

551, 343, 2\*(55:57)

Rapp, Anders and others  
ICE-WEDGE POLYGONS (?) IN PADJELANTA,  
SWEDISH LAPPLAND. (Isklar i Padjelanta?; Text  
in Swedish with English summary). Ymer, 3:188-  
202 incl. illus., diagrs., 1962. 19 refs.  
DLC, GN1, Y5

Digging in fine-grained lake sediments deposited during deglaciation revealed ground ice. Subsequent examination of aerial photographs showed a large area with conspicuous patterns interpreted as high-center ice-wedge polygons. These seem very similar to polygons of Alaska, with 4-6 sides, a diameter of 10-40 m and similar fracture forms. The area is SE of Lake Virihaure, 67° 20' N, 17° E at an altitude of 700 m (100 m above the tree line). The mean annual temperature is supposed to be -3° to -4° C. Mean annual precipitation is about 1000 mm. Winter snow cover is probably thin as there are many signs of wind erosion. These climatic factors together with the deposits of fine-grained sediments provide favorable conditions for ice-wedge formation. (From authors' summary)

SIP 22330

551, 374, 51(44)

Lilbourn, L.  
INSTABILITY OF TEMPERATURE (sic) ICE-  
SHEETS OWING TO A FEED-BACK MECHANISM.  
Nature, 203(4945):627-629 incl. graph, diagr., Aug.  
8, 1964. 5 refs.  
DLC, Q1, N3

The response of a temperate glacier to changes in its specific budget is examined theoretically with emphasis on the plane problem. For the calculations, the firn is changed into an equivalent ice sheet of compact size. Nye's algebraic model (SIP 21186) is presented and analyzed. Isostatic rebound values are given for a longitudinal cross section of the Glacier de Saint Sorlin, and a formula for the feedback (an increase in the specific budget of an ice sheet at a given point) mechanism is given. It is concluded that Nye's algebraic model of a glacier is unstable and that an active ice sheet cannot end on a level bedrock with a stable edge-shaped snout. It must advance or recede until it reaches some special area. Thus, temperate ice sheets fluctuate within areas of stability, and from time to time recede or advance from one area of stability to another. This explains the formation of recessional moraines during the last stage of the ice age. -- BLE

SIP 22331

551.345:551.521

Goll, György  
 INCREASE OF ALBEDO VALUES FOLLOWING THE  
 FREEZING OF A WET SOIL SURFACE. (A nedves  
 talaj megfagyásakor mutatózó albedonövekedés;  
 Text in Hungarian with English summary). Időjárás,  
 68(1):42-43 incl. graphs, Jan.-Feb. 1964.  
 DLC, QC851.M125

According to an optical hypothesis on the production of albedo phenomena, the remission of light should be increased by the freezing of the water content of the soil. This phenomenon could be motivated partly by the fact that the index of refraction is lower for ice than for water, and partly by the circumstance that the water freezing between the soil particles is often giving rise to the production of surface elements which are leading to light remission by total reflection. By measurements executed on two samples of soil, it was found that the albedo value corresponding to white light, in the case of a soil having a bright yellow color and possessing a water content of 20%, was increased on freezing from 23% to 26.4%, while in the case of a brown forest soil the increase was from 9% to 12%. (Author's abstract)

SIP 22332

551.524.37:551.501.3(73)

Gilman, George D.  
 THE FREEZING INDEX IN NEW ENGLAND. Special  
 Rept. 63, U. S. Army Cold Regions Research and  
 Engineering Laboratory, 16p. incl. tables, graphs,  
 maps, June 1964. 7 refs.  
 CRREL files

A summation is presented of normal and colder-than-normal air-freezing indexes for New England. Freezing index maps and empirical relationships are included for use when adequate local data are not available, and the specialized terms used in this report are defined. Hints are given to designers on the selection of a freezing index. Wherever possible, the selection of a design freezing index should be based on temperature records from an observation station close to the construction site because freezing conditions may vary widely over short distances. These variations are of greater importance in areas where the design freezing index is <1000 (i.e., a mean air-freezing index <500) than they are farther north. The data, the source of which is discussed, permitted the computation of the 5 coldest years in 30 for 71 stations. For the other stations, records were not complete for all 5 of the coldest years, but values were established on the basis of data available to provide as many useful indexes as possible. The colder-than-normal indexes are tabulated by station and year of occurrence. -- BLE

SIP 22333

551.501.1:551.593:535.7(\*2)

Kasten, Fritz  
 HORIZONTAL VISUAL RANGE IN POLAR WHITE-  
 OUT. Special Rept. 53, U. S. Army Cold Regions  
 Research and Engineering Laboratory, 5p., May  
 1962. 14 refs.  
 CRREL files

A theory on the horizontal visual range of objects of any color under overcast sky and over homogeneous ground is outlined. The theory considers the influence of the visual ground albedo on the illumination of the object and the dependence of the contrast threshold of the human eye on the visual angle subtended by the object viewed. The object always appears darker than the horizon. The visual range of a black object is greater than that of any brighter object and is independent of the visual ground albedo. The visual range of objects of low or medium visual albedo is also almost independent of the visual ground albedo so that they may be considered red as equivalent to black objects. But the visual range of white objects strongly depends on the visual ground albedo; it tends to zero when the visual ground albedo is greater than 0.94 even in clear air. The effect of the visual angle and hence of the diameter of the object on its visual range becomes marked only for visual angles smaller than 0.2°. The results explain the optical conditions encountered in polar whiteout. Measurements made in whiteouts in North Greenland proved the validity of the theory. (Meteorological and Geostrophys. Abstracts)

SIP 22334

551.33:551.462(7)

Farrand, W. R. and R. T. Gajda  
 ISOBASES ON THE WISCONSIN MARINE LIMIT IN  
 CANADA. Geographical Bull. No. 17:5-22 incl.  
 tables, graphs, maps, May 1962. 53 refs.  
 DLC, F1001.G4

In order to construct the isobase map, a single system of contours on the marine limit was drawn for the area between Amundsen Gulf in the western Arctic and the Atlantic coast of New England in the U.S.A. to depict the extent and pattern of postglacial submergence. To be considered concerning the genesis of the isobase system are: (1) the earth's crust was depressed by the load of the continental ice sheet, and world-wide sea level dropped eustatically more than 300 ft, (2) the retreat of the ice sheet from its maximum position began 18,000 to 20,000 yr ago along the southern border in the U.S.A. and more than 12,400 yr ago in the western Arctic, (3) in the later stages of deglaciation the ice sheet became divided into several segments centered on present-day inland areas, and (4) postglacial rebound was not only contemporaneous with deglaciation, but began prior to final disappearance of the ice. The pattern of isobases, supplemented by isobases on glacial lakes, includes a major dome centered on Hudson Bay, and minor cells over late-glacial remnants such as the Keewatin ice divide and

Bafin and Ellesmere Islands. Radiocarbon dates and uplift curves show that this uplift is truly glacio-isostatic. -- BLE

SIP 22335

551.351(\*423)

Løken, Olav

THE LATE-GLACIAL AND POSTGLACIAL EMERGENCE AND THE DEGLACIATION OF NORTHERNMOST LABRADOR. Geographical Bull. No. 17:23-56 incl. illus., tables, diagrs., maps, May 1962. 33 refs.  
DLC, F1001.G4

Detailed studies of the glacial morphology and raised shore features along the coastal part of the Torngat Mountains permit an appraisal of the late-glacial and postglacial emergence of the area in association with the final retreat of the last ice sheet. Three specific strandlines are identified and found to tilt NNE; these are in turn truncated by a fourth, younger, horizontal strandline, 15 m above sea level. Iso-bases are drawn for the sea levels represented by two of the strandlines, and the map is the first attempt to show isobases for Northern Canada from essentially contemporaneous shore features. Retreat and readvance phases of the outlet glaciers from the continental ice sheet to the west are identified, and the strandlines have provided a tool by which isolated moraines could be correlated. The only absolute date is provided by a radiocarbon-dating of  $9000 \pm 200$  yr for shells found at 29 m above sea level. Theoretical and practical studies by Scandinavian workers in this specialized field of physical geography are discussed in terms of their application to similar problems in Canada, and field and laboratory techniques that provide a basis for the present study are described. (Author's abstract, modified)

SIP 22336

69.053(\*2)

Sherwood, G. E.

PIONEER POLAR STRUCTURES. ACCESSORIES FOR THE JAMESWAY SHELTER. Tech. Rept. R-241, Type C, Final Rept., U. S. Naval Civil Eng. Lab., 57p. incl. illus., graph, diagrs., May 28, 1963. 7 refs. (Task Y-F015-11-146)  
DLC, Tech. Rept. Collection

Accessories were developed for improving the Jamesway in order to provide a suitable light-weight, quick-erecting shelter for use as quarters, messing, galley, utilities, administration, and other such applications, in pioneer polar camps. These accessories included a heavy-duty floor and foundation system, a wall-extension kit, special entry kits, and improved electrical distribution system, and special utility accessories. Prototypes of the accessories were fabricated and evaluated by the Laboratory.

Evaluation indicated that they met the requirements of pioneer polar operations and increased the general usefulness of the Jamesway shelter. It was concluded that the heavy-duty floor and foundation system, the wall-extension kit, the special entries, and the improved electrical distribution system should be accepted as standard accessories for the Jamesway shelter. The special utility accessories should be considered for use with the Jamesway for special applications. (See SIP 21276) (Author's abstract)

SIP 22337

624.144.53(52)

Koyama, M., T. Takahashi and Y. Kawai

ON THE EFFECT OF SPREADING  $\text{CaCl}_2$  MIXED SAND ON THE SKID RESISTANCE OF AN ICED ROAD SURFACE. (Enka karushiumu kongōsa o sanpu shita bari no hyōketsu romen no suberi teikō ni tsuite; Text in Japanese). Hokkaido Kaihatsukyoku Doboku Shikenjo Ceppo, No. 128:1-11 incl. illus., tables, graphs, Feb. 1964. 8 refs.  
DLC, Orientalia Div.

Indoor tests were made by spreading a  $\text{CaCl}_2$ -sand mix over an ice surface at  $-2^\circ$  to  $-5^\circ\text{C}$  and  $-8^\circ\text{C}$ . Slid and static resistance was measured. Field tests were conducted on a 7.5-m wide ice-covered asphalt road and on a 5-m wide snow-covered (10-20 cm) pebble road. Skid resistance was determined by measuring the sliding distance after applying the brakes of an automobile travelling 10-20 km/hr. Test results are given. CST/BLE

SIP 22338

534.24:551.326(\*60)

Buck, Beaumont M. and Charles R. Greene

ARCTIC DEEP-WATER PROPAGATION MEASUREMENTS. J. Acoustical Soc. Amer., 36(8):1528-1533 incl. table, graphs, diagrs., Aug. 1964.  
DLC, QC221.A4

Experimental results of acoustic-propagation measurements made in the Beaufort Deep of the Arctic Ocean in April 1963 are given. Explosive source stations were made by light aircraft at distances of 3, 6, 9.5, 13.5, 20.5, 46, and 115 nautical miles from a manned camp where the signals from hydrophones in the water and seismometers mounted in the ice were recorded. From these measurements, and from ray calculations based on measurements of water temperature made during the experiment, the following were derived and are presented: transmission loss as a function of frequency, range, the relative energy content of signals from surface- and bottom-reflected rays; the relative effectiveness of hydrophones and ice-mounted vertical seismometers in detecting underwater sound energy; and transmission loss in excess of predicted divergence loss. It is concluded that, contrary to previous long-range measurements, there was no sharp cutoff at 50-60 cps up to a range of about 100 mi. Saxton's predic-

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tion equation for divergence loss in a surface-bounded duct, together with measured values of reflection loss, offer a convenient and accurate approximation of transmission loss for ranges in excess of 50 mi in Arctic deep water. It is feasible to conduct acoustic experiments from small, temporary camps far into the Arctic ice pack in springtime. (Authors' abstract, modified)

SIP 22339

534.24:551.326(\*60)

Milne, A. R.  
UNDERWATER BACKSCATTERING STRENGTHS OF ARCTIC PACK ICE. J. Acoustical Soc. Amer., 36 (8):1551-1556 incl. illus., graphs, diagrs., Aug. 1964. 3 refs.  
DLC, QC221.A4

The backscattering strengths under Arctic sea ice for octave bands between 12 cps and 4 kc/sec were measured, using explosive sound sources. The measurements were made from a camp established in April 1962 on broken and pressure-packed one-year ice over the Canada Deep. Recordings of reverberations and calibrations were played back through octave-band filters on a logarithmic Sanborn recorder. The curves of reverberation pressure vs. time are shown, and the formula is given by which the backscattering strengths were derived. For grazing angles between 5° and 14°, the results show a dependence of scattering strengths both on grazing angle and frequency. The dependence on grazing angle is small in frequencies above the 0.5- to 1-kc/sec band and large in the 12- to 25-cps band. (Author's abstract, modified)

SIP 22340

551.322:549.2

Muguruma, Jiro and Akira Higashi  
OBSERVATION OF ETCH CHANNELS ON THE (0001) PLANE OF ICE CRYSTAL(sic) PRODUCED BY NON-BASAL GLIDE. J. Phys. Soc. Japan, 18(9):1261-1269 incl. illus., diagrs., Sept. 1963. 10 refs.  
DLC, QC1.P47

A method of producing minute etch pits on the (0001) surface of ice crystals in coordination with electron microscope observations was used to reveal dislocation behavior in ice crystals. Etch channels were found which run in the crystallographic direction,  $\langle 11\bar{2}0 \rangle$  or  $\langle 10\bar{1}0 \rangle$ . The origin of these etch channels are discussed, and a mechanism of their formation is presented. In the case of inclined trails on the (1010) glide plane, deposition of impurities on the (0001) plane is assumed to motivate the etching. The mechanism is believed to be plausible by reason of various features of the etch channels. (Authors' abstract, modified)

SIP 22341

621-498-59:624.148.7

Jordan, Charles B.  
ARCTIC FIELD TEST - ALL-WEATHER BRAKE FLUID. Rept. No. 151, U. S. Army Coating and Chemical Laboratory, Aberdeen Proving Ground, Md., 26p. incl. tables, appendixes A-C, Nov. 12, 1963. 5 refs.  
DLC, Tech. Rept. Collection; DDC, AD 425420

This report covers the results of Arctic tests at Fort Wainwright, Alaska, to evaluate the low temperature field performance of an all-weather hydraulic brake fluid. New brake cylinders were packaged with the all-weather brake fluid and installed on 1/2, 3/4, 2-1/2, and 5 ton facility vehicles. The brake fluid was placed in the brake systems, and the vehicles were then placed in normal operation from Dec. 12, 1962, to March 1, 1963. Eleven of the 14 vehicles were parked outside, and ambient temperatures during the test period ranged from 38° to -49° F. Fluid temperatures after soak were generally 8° to 10° higher than ambient. The brake fluid performed satisfactorily in all vehicles. (Author's abstract, modified)

SIP 22342

551.33:778.35:624.051(\*41:\*3)

Fletcher, Roy Jackson  
THE USE OF AERIAL PHOTOGRAPHS FOR ENGINEERING SOIL RECONNAISSANCE IN ARCTIC CANADA. Photogrammetric Eng. 30(2):210-219 incl. illus., tables, March 1964. 5 refs.  
DLC, TA593.A2P5

Soil and vegetation features that indicate unstable soil and detrimental permafrost, as well as the identification of rock types, are summarized and illustrated with aerial photographs. The engineering quality and photographic recognition of a variety of Arctic landforms is treated in detail. In permafrost, a deep active layer (thaw zone) is necessary for a stable structure, especially asphalt runways whose black color causes it to absorb considerable heat. Construction sites in the Arctic that have the following features should be avoided: many rounded or rectangular-shaped lakes, sorted circles, low-center polygons, small high-center polygons, low-land vegetation, beaded (not braided) streams, solifluction lobes and stripes, and north-facing slopes. The most favorable landforms for construction are beach ridges, river terraces, raised deltas and eskers composed of a sandstone, dolomite, granite, gneiss or diabase gravel-sand mixture. -- BLE



# CRRRL BIBLIOGRAPHY

SIP 22343

551.521"324"(\*701)

Flowers, E.  
WINTER RADIATION MEASUREMENTS AT THE  
SOUTH POLE. Trans. Amer. Geophys. Union, 45  
(1):56-57, March 1964. [Abstract only]  
DLC, QE500.A6

Long-wave radiation measurements made at Amundsen-Scott Station during the winter period of 1960 are used in discussing various relationships between the measured radiation values and certain meteorological variables. It was found that the average monthly sky cover value could be used to estimate the average monthly net radiation. The Yamamoto and Elsasser radiation charts were used with the mean, winter, clear-sky atmospheric temperature curve; they gave best agreement between the observed and chart-calculated atmospheric radiation when an assumed relative humidity of 75% was used with the Yamamoto chart and 50% with the Elsasser chart. A relationship is described between the mean tropospheric temperature and measured atmospheric temperature and measured atmospheric radiation utilizing simultaneous radiation-radiosonde observations during clear-sky periods. (Author's abstract)

made over the Ross Sea ice in a Navy C-540 equipped with up- and down-facing Eppley pyranometers. Overlapping vertical photography and observations of outside conditions were taken simultaneously with the radiation measurements over various concentrations and types of ice and with the Sun at various elevations in the sky. Most of the flights were attempted in clear weather at constant aircraft altitude over ice types as uniform as could be found. The effects of different altitudes of the aircraft on the received radiation at the sensors were investigated on two different occasions. Neither variation of albedo over a uniform solid ice surface with solar elevations between 10° and 30° above the horizon nor variations with different altitudes of the aircraft proved as significant as anticipated, which confirms the findings of other investigators. A discussion of sources of errors in the derived results and means of improvement in the techniques is given. (Author's abstract, modified)

SIP 22344

551.511.33:551.571(\*7)

Weyant, W. S.  
NET LATENT HEAT TRANSPORT INTO ANTARCTICA. Trans. Amer. Geophys. Union, 45(1):57, March 1964. [Abstract only]  
DLC, QE500.A6

The net transport of water vapor into Antarctica is computed for each month of a calendar year, using upper-air data from stations around the Antarctic periphery, and various assumed relative humidity values for those levels and months which lack humidity data. The absolute maximum inward transport is obtained by assigning 100% humidity to southward moving air and 0% to northward moving air. Other more realistic assumptions of humidity are used to obtain a reasonable estimate of the net transport of water vapor into the Antarctic and the corresponding mean annual precipitation over the Antarctic area. Results are compared with estimates of precipitation obtained by other methods such as the water-mass balance of the Antarctic. (Author's abstract)

SIP 22346

551.463.6(\*41)

Banks, R. E.  
THE COLD LAYER OF THE GULF OF ST. LAWRENCE. Trans. Amer. Geophys. Union, 45(1):65, March 1964. [Abstract only]  
DLC, QE500.A6

Hydrographic and BT data for the Gulf of St. Lawrence covering the period 1952-1962 have been studied to determine the properties and origin of a cold layer, found at intermediate depths, which is a characteristic feature of this area. The annual renewal and decay of the layer is examined. It is shown that the layer is little influenced by the inflow of Labrador water either through Cabot or Belle Isle Straits. A correlation is noted between summer temperatures in the layer and severity of the previous winter's ice condition. It is concluded that the cold layer is almost entirely the result of local winter cooling. (Author's abstract)

SIP 22345

551.326:551.521(\*881)

Predoehl, Martin C.  
AERIAL MEASUREMENTS OF ALBEDO OF SEA ICE IN THE ANTARCTIC. Trans. Amer. Geophys. Union, 45(1):57, March 1964. [Abstract only]  
DLC, QE500.A6

During Oct. and Nov. 1962, a series of flights was

SIP 22347

551.324.28:551.324.5(\*727)

Lisignoli, César A.  
MOVEMENT OF THE FILCHNER ICE SHELF, ANTARCTICA. IG Bull. No. 63:9-15 incl. tables, graphs, maps, May 1964. 4 refs. Also: Trans. Amer. Geophys. Union, 45(2):391-397, June 1964.  
DLC, QE500.A6

A triangulation network begun in 1957 between Shackleton, Belgrano, and Ellsworth Stations, extending east to Moltke Nunatak was completed in 1962. Latitude determinations from Feb. 1957 to Sept. 1962 at Ellsworth show a mean annual northward movement of about 1500 m/yr. Movements of the other stations are: Shackleton (Feb. 1957-March 1961), 1135 m/yr; Belgrano (May 1958-Dec. 1958),

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1372 m/yr. A slight increase in speed toward the west is suggested by these movements. Periodical oscillatory movements in longitude at Ellsworth are probably due to pressures exerted at different time intervals. The estimated annual volume of ice discharge for the eastern Filchner Ice Shelf is 90.6 km<sup>3</sup>; a total area of about  $1.7 \times 10^6$  km<sup>2</sup> drains through this relatively small (240-km) shelf front. If accumulation and discharge were in equilibrium, about 5.3 cm/yr of ice accumulation over the drainage area would be required to balance the discharge. According to available data, this figure is of the right order for the interior of the plateau, making this outlet one of the major ones of Antarctica. -- JFS

SIP 22348

551, 579, 2:551, 509, 3  
539, 1, 074:551, 578, 46

Anderson, H. W., P. M. McDonald and L. W. Gay  
GAMMA AND NEUTRON PROBES FOR MEASURING  
HYDROLOGIC CHARACTERISTICS OF SNOW.  
Trans. Amer. Geophys. Union, 44(1):48, March  
1963. [Abstract only]  
DLC, QE500, A6

Rapid measurement of hydrologic characteristics of mountain snow packs which permit more accurate appraisal and prediction of melting, may be possible using gamma and neutron probes. Commercially available probes with gamma and neutron sources were tested for their ability to measure snow density, ice lenses, and the thermal quality (free water) of the individual layers. Snow density (determined gravimetrically) ranged from 12 to 60%. Usable regressions of snow density with neutron counts and gamma counts minus 5000 in counts per minute were obtained. The regressions were improved by using the counts 6 in. above the measurement depth and 6 in. below it as well as those at the measurement depth. (Measurement results are given in this abstract.) Standard errors were 3.6 and 2.3%. Counts in water for these probes with aluminum access tubes were 15,900 and 44,400 counts per minute for the neutron and gamma probes, respectively. Ice lenses in the snow were readily detectable by shifts in the neutron probe counts. Neutron counts increased markedly upon the occurrence of ice; gamma counts were only slightly affected. Snow pack thermal quality was related to the neutron count. An apparent relationship exists between the neutron- and gamma-count profile in a snow pack in early spring and the amount of heat which will be required to initiate snowmelt. (Authors' abstract, modified)

SIP 22349

551, 343, 2:551, 337(\*762)

Black, Robert F. and Thomas E. Berg  
DATING WITH PATTERNED GROUND, VICTORIA  
LAND, ANTARCTICA. Trans. Amer. Geophys.  
Union, 44(1):48, March 1963. [Abstract only]  
DLC, QE500, A6

Patterned ground in Victoria Land consists commonly of sand-wedge polygons in dry valleys and ice-wedge polygons along more humid coasts. In most places wedges of sand or ice or composites are growing today at predictable rates dependent on their physical environment. Temperature regimen, lithology, texture, and moisture content control contraction cracks in permafrost. Seasonal and daily thermal changes in permafrost, active layers, and vapor pressure gradients in ground and air determine which wedges grow. Their rates of growth differ markedly. Data on physical environment and rates of growth of each type, collected since Dec. 1960, now permit preliminary estimates to be made of the age of patterned ground. If we can assume that permafrost has been present since glaciers vacated the dry areas, even though marked fluctuations in climate may have occurred, patterned ground indicates that deglaciation in all areas visited was not older than late or classical Wisconsin. Previous correlation of deposits of Taylor and McMurdo glaciations, for example, with pre-Wisconsin glaciations is incompatible. (Authors' abstract, modified)

SIP 22350

551, 322:536, 4, 031:541, 135

Uzu, Y., I. Sano and Y. Fujitani  
AN EXPERIMENTAL INVESTIGATION ON THE  
FREEZING OF DROPLETS OF WATER AND OF  
AQUEOUS SOLUTIONS, WITH PARTICULAR REFERENCE TO THE INFLUENCE OF THE SOLUTE.  
J. Colloid Sci., 18(8):697-704 incl. illus., tables, graphs, Oct. 1963, 15 refs.  
DLC, QD549, J67

The freezing temperature of droplets is closely connected with the concentration and valency of electrolytes dissolved in the water. The highest freezing temperatures appear at a concentration of nearly  $10^{-4}$ - $10^{-5}$  N for 1-1 electrolytes (NaX, KX), at  $10^{-6}$  N for the 1-2, 2-1 electrolytes (K<sub>2</sub>SO<sub>4</sub>, BaX<sub>2</sub>), and at  $10^{-8}$  N for the 1-3, 3-1 electrolytes (K<sub>3</sub>PO<sub>4</sub>, AlX<sub>3</sub>), where X = Cl, Br, I. The more multivalent the electrolyte used, the more effectively it acts as the freezing agent. For the measurement of the freezing temperature, electrolyte solutions were made of supercooled fogs, and the formation of ice crystals was detected with an apparatus using an electrically heated platinum wire. (Authors' abstract, modified)

SIP 22351

551, 461, 2:713\*551, 763

Eardley, A. J.  
POLAR RISE AND EQUATORIAL FALL OF SEA  
LEVEL SINCE THE CRETACEOUS. J. Geol. Educ.  
12(1):1-11 incl. graphs, maps, March 1964, 12  
refs.  
DLC, QE40, J6

Study of submerged and emerged shorelines, and of

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the depths of continental shelves, suggests that sea level has risen in the Arctic and Antarctic regions and fallen in the equatorial regions since the Cretaceous. The amount seems to be in the range of 600 ft. Antarctica, if adjusted upward to pre-ice conditions, would be considerably embayed, and its continental shelf is unusually deep. Isostatic adjustments incident to ice melting could not restore this shelf to the usual low-latitude depths. A charting of depths of the outer margin of the continental shelves from the Arctic along both sides of North America and South America to Antarctica reveals an outer shelf margin at a depth of 500 to 600 ft in the low latitudes and a progressive deepening of this outer margin to 1300 or more feet in the Arctic and Antarctic regions. The cause of such a shift in sea level appears to be a slowing rate of rotation of the earth, which, if extrapolated back 100 million years, would yield an angular velocity about 1/30 faster than now. The gradual change in land and sea areas may have brought on the ice age. (Author's abstract, modified)

SIP 22352

551.521.31(285:762)

Boare, R. A. and others  
LAKE BONNEY, TAYLOR VALLEY, ANTARCTICA:  
A NATURAL SOLAR ENERGY TRAP. *Nature*, 202  
(4935):886-888 incl. tables, graphs, map, May 30,  
1964. 4 refs.  
DLC, Q1.N2

Lake Bonney is a natural example of the trapping and storing of solar energy by a salt-water density gradient. Enough light passes through the 12-ft-thick ice cover during the short Antarctic summer to maintain maximum temperatures of 7°C and 1.3°C in the eastern and western lobes, respectively, despite a mean annual air temperature of about -20°C. Solar radiation intensity, as measured with a bolometer, decreased exponentially with depth, being reduced by 50% every 12 ± 1 ft in both lobes of the lake. The fraction of incident radiation penetrating the ice and water to a depth of 20 ft was 1.1% in the eastern lobe and 0.23 in the western, but this figure probably depends greatly on the condition of the ice surface. Temperature-chlorinity profiles are presented for each lobe. Assuming the lake to be in thermal equilibrium, calculated temperature profiles approximate the measured profiles. The small deviation between the two is probably due to the eastern lobe heating up and the western lobe cooling down. Chemical data suggest that the eastern lobe rose and became density-stratified about 100 yr ago, and that, at the same time, the western lobe, which has been density-stratified for many thousands of years, rose about 25 ft, thus reducing the heat input to the bottom of the lake. The heat required to be radiating downward past the 20- and 15-ft levels in the eastern and western lobes on this model turns out to be 780 and 640 cal/cm<sup>2</sup>/yr, respectively. These figures compare favorably with the radiation received at Scott Station, 66 mi away. -- JFS

SIP 22353

551.481.1(762)

Angino, Ernest E., Kenneth B. Armitage and  
Jerry C. Tash  
PHYSICOCHEMICAL LIMNOLOGY OF LAKE BON-  
NEY, ANTARCTICA. *Limnol. and Oceanogr.* 9(2):  
207-217 incl. illus., tables, graphs, diagrs., April  
1964. 23 refs.  
DLC, GC1.L5

Lake Bonney is a permanently ice-covered lake of 3.2 km<sup>2</sup> in upper Taylor Valley, Victoria Land. The mean depth, without ice cover, is 18.7 m. The lake probably occupies a glacially overdeepened valley. The lake is meromictic. The maximal temperature of 7°C coincides with the chemocline at about 15 m; the temperature decreases to a range of -2 to -4°C in the bottom waters and to less than 1°C beneath the ice. Calculations of superficial water inflow and of water loss by sublimation of ice indicate that the lake is slowly shrinking. Old shorelines above the present lake level attest to shrinkage. Part of the difference between water gain and water loss is made up by inflow of warm-spring water at depth. Such springs are probably the major source of heat for the lake. Total solids in the monimolimnion range up to 407.3 g/l. Sodium and magnesium chloride account for 96% of the dissolved salts. An analysis of ionic ratios suggests that the lake waters may consist of trapped seawater highly modified by subsequent concentration by evaporative processes, by addition of ions from surrounding soils, and by addition of warm-spring water. The ionic concentrations are altered in part by the precipitation of CaSO<sub>4</sub>, CaCO<sub>3</sub>, and Na<sub>2</sub>SO<sub>4</sub>. (Author's abstract)

SIP 22354

551.3.051:624.155:551.326.85(749)

Colinvaux, Paul A.  
SAMPLING STIFF SEDIMENTS OF AN ICE-  
COVERED LAKE. *Limnol. and Oceanogr.* 9(2):262-  
264 incl. diagrs., April 1964. 6 refs.  
DLC, GC1.L5

Summer work at Imuruk Lake, Seward Peninsula, Alaska, demonstrated that sampling the sediments of a large lake by hand from a raft of rubber boats was impractical if the lake sediments were stiff and the lake surface frequently rough. These difficulties were overcome by fitting a cutting bit to the sample tubes by using a small pile driver for driving and pulling, and by taking advantage of the firm platform provided by the winter ice. The drilling procedure and assembly are described and illustrated. During the winter operation at the lake, a core more than 8 m long was raised in about 8 hr. The tripod legs and the motor assembly were bolted to the ice. Movement of the extension rods in the casing kept the water in it from freezing. Ethylene glycol antifreeze, which was poured into the casing, kept the opening free overnight. Frozen connections (the most difficult part of the operation) were thawed by bathing the joints in gasoline and lighting it; however, the joints had to be disconnected very quickly or they refroze. -- BLE

# CRREL BIBLIOGRAPHY

SIP 22355

551.521.31(285:762)

Shircliff, T. G. L. and R. F. Benseman  
A SUN-HEATED ANTARCTIC LAKE. *J. Geophys. Res.* 69(16):3355-3359 incl. tables, graphs, diagr., Aug. 15, 1964. 7 refs.  
DLC, QC811.J6

Measurements made in Jan. 1963 at Lake Bonney, Antarctica, showed that the maximum water temperature was about 7.5°C at a depth of 10 to 15 m. Measurements of density, electrical conductivity, and chloride content indicated that the water was stratified and stable. The absorption length for solar radiation was 8.2 m. It is concluded that the primary heat source was solar radiation. (Authors' abstract)

SIP 22356

551.33(6)

Downie, Charlie  
GLACIATIONS OF MOUNT KILIMANJARO, NORTH-EAST TANGANYIKA. *Bull. Geol. Soc. Amer.* 75(1):1-16 incl. illus., tables, diagr., map, Jan. 1964. 20 refs.  
DLC, QE1.G2

Six glacial episodes are recognized on Kilimanjaro. At the principal volcanic center of Kibo these were interrupted by volcanic activity. The smaller volcanic center of Mawenzi has been extinct longer, and the glaciations have been superimposed. Shirz, the lowest of the 3 volcanoes in the group, has been only slightly affected by glaciation. The successive glacial episodes are named the First, Second, Third, Fourth (Main), Little, and Recent, of which the Third was the most extensive; however, most of the obvious glacial features belong to the Fourth Glaciation which covered about 150 mi<sup>2</sup>. The Little and Recent Glaciations are smaller in extent and post-Pleistocene. The climatic pattern was probably similar at all times to that of today, and the thickest and longest glaciers were generally on the south and west slopes. Comparison with other glaciated regions in East Africa shows some similarities, and a similar sequence has been suggested for the East African pluvial periods. (Author's abstract)

SIP 22357

551.338:581.33:551.345(\*49)

Colinvaux, Paul A.  
ORIGIN OF ICE AGES: POLLEN EVIDENCE FROM ARCTIC ALASKA. *Science*, 145(3633):707-708 incl. table, map, Aug. 14, 1964. 14 refs.  
DLC, Q1.835

Pollen analysis of radiocarbon-dated samples from the Arctic coastal plain of Alaska shows that vegetation of 14,000 yr ago reflected a climate colder than the present. There has been a progressive warming,

culminating in the present cold Arctic climate. The record indicates that the Arctic Ocean has been covered with ice since the time of the Wisconsin glacial maximum, which suggests that the essential condition of the Ewing and Donn hypothesis for the origin of ice ages, that the Arctic Ocean was ice-free up to 11,000 yr ago, cannot be met. (Author's abstract)

SIP 22358

551.46.07'1964'(\*881)

Tierney, James Q.  
1964 SHIPBOARD OCEANOGRAPHIC PROGRAM OF THE U.S. NAVAL OCEANOGRAPHIC OFFICE. *Bull. U. S. Antarctic Projects Officer*, 5(4):10-11 incl. map, Dec. 1963.  
DLC, GPRR

The 1964 program will involve five oceanographers on the *Atka* in the Ross Sea area between Feb. 1 and March 5. About 90 stations, spaced on a 30-mi grid oriented normal to the Ross Ice Shelf barrier, will be occupied. In addition, 28 ice-forecast stations extending from lower McMurdo Sound to Cape Adare, will be reoccupied. These stations have been visited annually since 1961 as part of a long-range ice potential forecasting program designed to predict the time of freeze-up and rate of growth of sea ice. The oceanographic and ice-forecast station locations are shown on a map. The oceanographic measurements will consist of water temperature, salinity, dissolved oxygen and nitrogen, and inorganic phosphate. Sea-water samples will also be frozen for later laboratory analysis for nitrate-nitrite and silicate. Marine and benthic biological samples and bottom sediments will be collected. -- JFS

SIP 22359

656.7(047.1)(\*7)

McCleary, George, Jr.  
AIR TRANSPORTATION IN THE ANTARCTIC. *Bull. U. S. Antarctic Projects Officer*, 5(5):12-16 incl. illus., Jan. 1964. 15 refs.  
DLC, GPRR

This review covers the highlights of Antarctic aviation, beginning with the use of a monoplane by Wilkins at Deception Island in 1928. With the use of three airplanes in 1928-30, Byrd developed the technique of supporting field parties using aircraft. He also introduced new instruments for accurate aerial navigation and the aerial mapping camera. Wilkins' use of a float airplane in 1929 introduced the technique of exploring coastal areas from open water, a useful method for the next 20 yr. Byrd's next (1933-35) expedition used four aircraft, including an autogiro. In 1935, Lincoln Ellsworth was successful in crossing Antarctica by airplane and showed that landings and takeoffs could be made in the interior. Thus, by 1935, four methods of air operations had been introduced to Antarctica--operations from land, sea, and

# CRREL BIBLIOGRAPHY

snow surfaces by airplanes, and helicopter operations. During Operations Highjump and Windmill, ski-equipped and wheeled aircraft and helicopters were used successfully. Since the IGY began, airplanes have become a vital part of Antarctic activities. This season [1963-64], the U.S. is using 22 navy aircraft, 3 army helicopters, and 6 air force aircraft. Photographs show the major types of aircraft presently used in the Antarctic. -- JFS

SIP 22360

551.322:531.754

Bader, Henri

DENSITY OF ICE AS A FUNCTION OF TEMPERATURE AND STRESS. Special Rept. 64, U. S. Army Cold Regions Research and Engineering Laboratory, 6p. incl. tables, graph, Aug. 1964. 5 refs.  
CRREL files

The equations for calculating the density of ice of moderate porosity (density  $>0.8$ ) as a function of temperature and stress are developed, and the values of parameters are calculated from the best available experimental data. Temperature is changed isopiezically, and pressure is changed isothermally. The following three statements were assumed to be valid: (1) ice aggregates are isotropic with respect to thermal expansion and elastic reaction to stress, (2) ice of low porosity (very dense snow or bubbly ice) has a coefficient of thermal expansion equal to that of bubble-free ice, and (3) the magnitude of naturally occurring bubble air pressure has no effect on thermal expansion nor on elastic behavior. -- BLE

SIP 22361

629.12.037:629.124.75

Ignat'ev, M. A.

DETERMINATION OF ICE LOAD ENCOUNTERED BY SHIP PROPELLER BLADES. (Opredelenie ledovykh nagruzok, vosprinimaemykh polostfami grebnogo vinta; Text in Russian). Problemy Arktiki i Antarktid, Vyp. 15:41-51 incl. illus., tables, graphs, 1964. 2 refs. (Eng. transl.: Office of Tech. Services, U. S. Dept. of Commerce, Washington, D. C., TT:41303, Aug. 20, 1964).  
DLC, G575.L422

The forces which act on a propeller blade upon its interaction with ice are defined by 3 components: axial, circumferential, and radial. The radial component is difficult to determine under shipboard conditions and has slight effect on the loads encountered. Axial force is determined by eliminating from the total measured axial force the thrust produced by propeller blades whose surface is not in contact with ice. The circumferential component can be determined by the moment of resistance to the rotation of the propeller. Equations are given for all phases of the calculations and graphs are presented which show propeller movement in the func-

tions of forward speed and revolutions, the work of the forward starboard electric motor of the ice breaker "Captain Voronin" during interaction with ice, and the change of ice moments in time for various ships. The greatest moment of resistance of propeller blades in ice reaches 3 to 4 times the nominal moment of the motor during propeller work in a moored state. Automatic removal of torque from an electric drive motor does not guarantee propeller blades against damage; however, if the motor automatically increases its moment 2 to 3 times for 5 to 7 seconds, damage to propeller blades will be significantly reduced. -- BLE

SIP 22362

551.324.43

Weertman, J.

RATE OF GROWTH OR SHRINKAGE OF NONEQUILIBRIUM ICE SHEETS. J. Glaciology, 5(38):145-157 incl. graphs, diagrs., June 1964. 20 refs.  
DLC, GB2401.J68

An analysis is made of the time required to build up an ice-age ice sheet and of the time required to destroy such an ice sheet. The calculations are based on the assumption that the theory of perfect plasticity is valid. It is concluded that the time required to build up an ice-age ice sheet is longer than the time required to eliminate it. If it is assumed that the accumulation rate of an ice-age ice sheet lies in the range of 0.2 to 0.6 m/yr, it is found that the growth time of a large ice sheet is of the order of 15,000 to 30,000 yr. Ablation rates of 1 to 2 m/yr lead to shrinkage times of the order of 2000 to 4000 yr, provided that ablation occurs over an appreciable area of the ice sheet. (Author's abstract)

SIP 22363

551.324.5(73)

Kamb, Barclay and E. LaChapelle

DIRECT OBSERVATION OF THE MECHANISM OF GLACIER SLIDING OVER BEDROCK. J. Glaciology, 5(38):159-172 incl. illus., table, graphs, diagrs., June 1964. 20 refs.  
DLC, GB2401.J68

See SIP 21906:

Kamb, W. Barclay and Edward R. LaChapelle  
DIRECT OBSERVATION OF THE MECHANISM OF BASAL SLIP IN A TEMPERATURE [sic] GLACIER. p. 224. (In: General Assembly of Berkeley, 1963. Publ. No. 61, Intern. Assoc. Sci. Hydrol., Genthurges, Belgium, 1963).  
DLC, GPRR

# CRREL BIBLIOGRAPHY

SIP 22364

551.324.54:551.324.8(931)

Gunn, Bernard M.  
FLOW RATES AND SECONDARY STRUCTURES OF FOX AND FRANZ JOSEF GLACIERS, NEW ZEALAND. *J. Glaciology*, 5(38):173-190 incl. illus., tables, graphs, diagrs., map, June 1964. 12 refs.  
DLC, GB2401.J68

Fox and Franz Josef Glaciers have been retreating at an accelerating rate since the first records were made in 1867, especially since 1935. In March 1956, measurements were made of flow rates of Franz Josef Glacier along 9 transverse profiles at 33 stations. Maximum flow rates were found near the mid-line of the glacier with the highest rate (245 cm/day) immediately below the point where névé enters the constricted valley, and above a steep ice fall. The highest flow rate of the Fox Glacier in 1955 was 131.3 cm/day; in April 1956, it was 38.1 cm/day. Also investigated were marginal and basal slip, the correlation of strain rates with structure, crevasse patterns, and ablation rates. The conditions under which the longitudinal foliation is formed are not understood. Elongation of crystal fabric, flattening of air bubbles, and the presence of cleavage suggest that the compressive stress is inclined at an angle to the foliation and that shear is parallel to it. However, the flow rate profiles show that there can be no differential movement between laminae in the horizontal longitudinal direction near the mid-line of glaciation, although the foliation is well developed there. -- BLE

SIP 22365

551.324.28:551.324.8:548.2(+765)

Reid, John R.  
STRUCTURAL GLACIOLOGY OF AN ICE LAYER IN A FIRN FOLD, ROSS ICE SHELF, ANTARCTICA: ICE GRAIN ANALYSIS. *J. Glaciology*, 5(38):191-206 incl. illus., table, graphs, diagrs., map, June 1964. 28 refs.  
DLC, GB2401.J68

A highly deformed area in the Ross Ice Shelf near the Bay of Whales was studied during 1958-1959. A series of snow-firn folds up to 8 m high with a wave length of 100 m occur here. Along one of these folds, a unique ice layer formed during the 1952-1953 season. From sites along this layer, in 12 thin sections, 2300 ice grains were measured using the root mean-square method with the least-circle diameter. The data obtained indicate that (1) the mean diameter of the ice grains ranges from 4.5 mm in the ice from the crest of the anticline to 2.5 mm in the zone of maximum shear stress and/or in sections having a high air-bubble content; (2) the large diameter of the ice grains at the crest is attributed to greater solar radiation resulting from their proximity to the 1958-1959 snow surface and the surface of the exposed crevasse wall; (3) the area of maximum shear stress represented by small ice grains and "pyg-matic" folds is located almost half way between the crest and the trough; (4) grains in the trough are

larger than those in the shear zone because of less stress, and smaller than those at the crest because of deeper burial and the presence of a crevasse bridge which eliminates all direct radiation; and (5) the growth of the ice grains is therefore controlled by temperature, stress, and impurities. (Author's abstract, modified)

SIP 22366

551.321.84:551.324.83

Ramberg, Hans  
NOTE ON MODEL STUDIES OF FOLDING OF MORAINES IN PIEDMONT GLACIERS. *J. Glaciology*, 5(38):207-218 incl. illus., diagrs., June 1964. 5 refs.  
DLC, GB2401.J68

Structures simulating the complex folding of moraines and debris bands were tested qualitatively by whirling them in a centrifuge. The driving agency of an active glacier is almost solely the difference in potential energy between different points in the ice body, inasmuch as the movement is so slow that the inertial terms in the fluid-dynamic equations become insignificant. The centrifuge technique offers great advantages for scale-model studies of the evolution of complicated flow patterns in moraine-charged glaciers. The application of stroboscopic light permits observation of the flow pattern evolution during the run in the centrifuge. Three grades of bouncing putty with dissimilar viscosities were used as glacier-imitation materials. Powdered hard black Apiezon wax was used as imitation material for moraines and debris. As a substratum for the glacier a mountainous landscape was constructed from wax rigid enough to avoid sagging under the centrifugal force. The whole model fitted in a centrifuge cup 10.5 cm in diam. Results indicate that folding is caused by buckling in response to layer-parallel compression of competent layers embedded in less competent media, bending of enclosed sheet-shaped bodies that passively mimic the heterogeneous strain in the region, and accentuation of amplitude and compression of wave-length of an original curved pattern in a field of homogeneous strain. The strain distribution thus determined in a model glacier may be compared with the attitude of schistosity and elongation in a natural glacier. -- BLE

SIP 22367

551.578.46:551.311.3(94)

Costin, A. B. and others  
SNOW ACTION ON MOUNT TWYNAM, SNOWY MOUNTAINS, AUSTRALIA. *J. Glaciology*, 5(38): 219-228 incl. illus., map, June 1964. 26 refs.  
Discussion.  
DLC, GB2401.J68

Between March 1962, and April 1963, evidence of snow transport of stones was observed on Mt.

Twynam. The directions of movement were all down the general slope (25-30°) of the cirque wall. Fresh abrasion surfaces on different sides of 3 stones showed that they had been turned over. Older abrasion tracks belonging to previous years were also found. At the close of the season (April 1963) with little snow left on the cirque wall, about 1000 fresh abrasion tracks were seen. Several similar cases of abrasion of talus by stones, with the production of rock flour, were observed on the upper slopes of Mawson Cirque, 3 km south of Mt. Twynam, during the summers of 1962 and 1963. Other evidence that slow mass sliding of snow may be wide spread in this area, even down to elevations as low as 1500 m, is the twisting and bending over level of steel fence posts (4-cm faces), under conditions where the mere weight of snow on the fence wires can be discounted as the bending agent. Consequently, no sharp separation is possible between the erosional effects of snow-patches and small cirque glaciers. -- BLE

SIP 22368 551.324.54:528, 33:528, 7(\*76)

Adler, Ron K. H.  
SOME PHOTOGRAMMETRIC AND GEODETIC ASPECTS OF MEASUREMENT OF GLACIER SURFACE MOVEMENT AS FUNCTION OF TIME. *J. Glaciol.* 5(38):229-234 incl. diagr., map, June 1964. 2 refs.  
DLC, GB2401.J68

Ice movement on the Byrd Glacier, Antarctica, was measured as a function of time on the basis of aerial photography. Two strips of vertical air photographs from Nov. 1960 and Oct. 1961 were used. The aeroleveling method of strip triangulation with a minimum of geodetic control was applied. The method utilizes altimeter or stadioscope readings taken during the flight for each individual photograph to compute the relative differences in elevation between the air stations. Triangulation results are presented graphically for the 348-day period. Ice movement varied from about 50 m at the edges to about 850 m at the center. The average observed total movement at the center was 803.3 m  $\pm$  1%, or 2.31 m/day. The Laufen-Bauma area in Switzerland was chosen as a test area to verify the methods and procedures. -- JFS

SIP 22369 551.324.86

Mathews, W. H.  
WATER PRESSURE UNDER A GLACIER. *J. Glaciology*, 5(38):235-240 incl. graph, diagr., June 1964. 11 refs.  
DLC, GB2401.J68

Observations in a mine which reached the base of a valley glacier 150 m below the ice surface indicated

an initial cold and impervious condition at and near the ice-rock contact. Later, however, an excellent hydraulic connection with free water in the upper layers of the glacier was established, perhaps by the thawing of a passage upward through the ice by warm water escaping from the mine. Subsequent records of water levels, or of water pressures, within the mine, reflecting conditions in the upper part of the glacier, show periods of moderately steady conditions and slight diurnal fluctuations, interrupted by irregular and catastrophic surges, particularly during periods of rapid snow melt and heavy rains. A seasonal cycle in pressure is suggested by the record. (Author's abstract)

SIP 22370 551.324.6:551.521.14:551.324.05(\*2)

Bloch, M. R.  
DUST-INDUCED ALBEDO CHANGES OF POLAR ICE SHEETS AND GLACIERIZATION. *J. Glaciology*, 5(38):241-244, June 1964. 17 refs.  
DLC, GB2401.J68

Eustatic changes of the ocean in prehistoric and historical times are linked with the fate of the ocean-based salt industry, and are recognized as erratic. A hypothesis is proposed to explain these erratic changes with albedo changes of the polar ice sheets, caused in turn by erratic volcanic dust fallout. Ash layers in Antarctic ice cores are connected with historical dislocations of maritime civilizations. Albedo changes associated with the dusting of ice sheets are considered to be the cause of the decline of periods of glacierization generally. Such albedo changes are connected with volcanic activity on the one hand, and loess formation on the other, caused in turn by the growth of the ice sheets. (Author's abstract)

SIP 22371 551.332.56(540)

Saxena, H. B.  
THE GLACIAL LAKES OF KUMAON, INDIA. *J. Glaciology*, 5(38):245-247 incl. map, June 1964. 5 refs.  
DLC, GB2401.J68

In the Kumaon region of the outer Himalayas there is a chain of lakes which, on the basis of various features, were previously thought to be of tectonic origin. A detailed geological study of this area carried out in June 1961, revealed the presence of morainic deposits in the vicinity of the lakes, and it is now considered that they are essentially of glacial origin. (Author's abstract)

SIP 22372

551.322:539.377

Tegart, W. J. McG.  
NON-BASAL SLIP AS A MAJOR DEFORMATION  
PROCESS IN THE CREEP OF POLYCRYSTALLINE  
ICE. *J. Glaciology*, 5(38):251-254, June 1964. 17  
refs.

DLC, GB2401.J68

Published data on the creep of polycrystalline ice  
and crystals oriented for nonbasal slip are discussed  
in terms of theories of prismatic slip in hexagonal  
metals. It is concluded that creep of polycrystalline  
ice near the melting point is controlled by non-basal  
slip but a decision on the exact mechanism of slip  
cannot be made on the basis of available data.  
(Author's abstract)

SIP 22373

551.321.84:560.312

Corbató, Charles E.  
THEORETICAL GRAVITY ANOMALIES OF GLA-  
CIERS HAVING PARABOLIC CROSS-SECTIONS.  
*J. Glaciology*, 5(38):255-257 incl. diag., graph,  
June 1964. 2 refs.

DLC, GB2401.J68

Equations and a graph are presented for calculating  
gravity anomalies on a two-dimensional glacier  
model having a horizontal upper boundary and a  
lower boundary which is a parabola with a vertical  
axis of symmetry. (Author's abstract)

SIP 22374

551.324.28:54(+765)

Wilson, A. T. and A. J. Heine  
THE CHEMISTRY OF ICE-SHELF BRINES. *J.*  
*Glaciology*, 5(38):265-267 incl. table, graph, June  
1964. 7 refs.

DLC, GB2401.J68

Brine was sampled in the 1962-63 summer from a  
hole 1 km east of Scott Station and 1.5 km from the  
seaward edge of the Ross Ice Shelf. The chemical  
compositions of two core samples containing the  
brine are tabulated for  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Na}^+/\text{K}^+$ ,  $\text{SO}_4^{--}$ ,  
 $\text{Cl}^-$ ,  $\text{CL}^-/\text{SO}_4^{--}$ , and minimum temperature, and  
compared with sea water. The most probable origin  
for the brine is sea water percolating through the  
cold firn of the ice shelf where ice seeps rates from  
it, producing a brine considerably more saline than  
sea water. The minimum temperature to which the  
brine was subjected during its passage through the  
frozen firn of the ice shelf was  $-9.3^\circ\text{C}$ . The density  
of this brine would have been  $1.1\text{ g/cm}^3$ , since sea  
water would have lost 75% of its original water. As  
the brine percolates downward through the firn it  
would move to a region of higher temperature and  
thus ice would melt until the concentration of the  
brine is reduced to that of the ice-brine equilibrium

at that temperature. There is thus an inverted den-  
sity gradient imposed by a temperature gradient.  
The brine samples are depleted in  $\text{SO}_4^{--}$  (0.221 and  
0.316 g/l), as compared with sea water (2.3 g/l).  
Thompson and Nelson have shown that hydrated  
sodium sulfate crystallizes rapidly from sea water  
below  $-8.2^\circ\text{C}$ . Several occurrences of this salt on  
the ice in regions of ablation have been reported.  
This is probably the sodium sulfate which crystal-  
lized from the freezing sea water and moved up to  
the surface as the ice above it ablated. -- JFS

SIP 22375

551.324:548(+548+462)

Ostrem, Gunnar  
COMPARATIVE CRYSTALLOGRAPHIC STUDIES ON  
ICE FROM K'E-CORED MORAINES, SNOWBANKS  
AND GLACIERS. *Geografiska Annaler*, 45(4):210-  
240 incl. illus., tables, diagrs., maps, 1963. 37  
refs.

DLC, G25.G4

During 1959-1963 investigations were made of ice-  
cored moraines in Norway and Sweden and on Baffin  
Island, N.W.T., Canada. Ice samples were taken  
from ice-cored moraines, glacier tongues, and  
massive ice at the bottom of permanent snowbanks.  
Thin sections were prepared from all the samples in  
order to examine crystal size and, in special cases,  
the crystal orientation. The photographs were  
taken with a 35-mm camera at right angles to the  
thin section. A pronounced difference in crystal  
size was found between glacier ice (taken from gla-  
cier tongues) and the ice found in ice-cored mo-  
raines. Crystal size measurements suggest that  
the buried moraine ice has originated from snow-  
bank ice. The crystal orientation determinations  
indicate that one single preferred orientation is pre-  
sent in the moraine ice. In cases where dirt bands  
are present, the preferred orientation seems to be  
perpendicular to it. -- BLE

SIP 22376

551.324.4(+57)

Schytt, Valter and Stig Jonsson  
NOTES ON GLACIOLOGICAL ACTIVITIES IN  
KEBNEKAISE, SWEDEN - 1963. MASS BALANCE  
STUDIES ON STORGLACIAREN DURING 1963.  
*Geografiska Annaler*, 45(4):292-294 incl. graphs,  
map, 1963. 1 ref.

DLC, G25.G4

Data are presented on accumulation, ablation, bal-  
ance, long term trends, the retreat of glacier fronts,  
and summer temperatures on Storglaciaren. All  
observations have been corrected to show the situa-  
tion on May 24, 1963, which was chosen to repre-  
sent the end of the accumulation season. The accu-  
mulation map is based on 175 snow depth observa-



tions in the ablation area plus 31 pits and 15 coring sites, mainly in the accumulation area. Total accumulation amounted to 10% more than the average for the period 1945-63. The ablation was more than twice the amount of the previous summer but  $0.8 \times 10^6 \text{ m}^3$  less than the 1945-63 average. The 1962-63 budget year was not as unfavorable to Storglaciären as most of the preceding 17 yr. The balance was  $-0.6 \times 10^6 \text{ m}^3$ . The annual loss seems to stay constant when studied over periods as long as 40 yr and as short as 5 yr. The ablation curve shows no significant variations. The accumulation curve shows decreasing values during recent years. From Aug. 23, 1962, to Sept. 1963, Storglaciären retreated 11 m, Isfallsglaciären retreated 13 m, and SE Kaskasatjakkaglaciären retreated 5 m. Mean monthly temperatures during the 1963 summer ranged between  $2.8^\circ \text{C}$  and  $7.7^\circ \text{C}$ . -- BLE

SIP 22377

551.324.63(\*57)

Schytt, Valter and Per Cederstrand  
NOTES ON GLACIOLOGICAL ACTIVITIES IN  
KEBNEKAISE, SWEDEN - 1963. GLACIER RE-  
TREAT STUDIED BY LEVELLED PROFILES.  
Geografiska Annaler, 45(4):264-296 incl. graphs,  
1963.  
DLC, G25.G4

During the 1961 summer field course at Tarfala Station an observation program was started to study the thickness changes of Storglaciären as a consequence of its usually negative annual mass balance. Information was also obtained on the propagation of possible travelling waves. One longitudinal profile was established between a well-defined point in solid rock above the bergschrund and another point on a large boulder just outside the front of the glacier. Reference objects were also marked with yellow paint on the opposite side of the Tarfala valley into which Storglaciären flows from the west. The ice surface along the longitudinal profile rose considerably between July 14, 1961, and July 3, 1962. Insignificant changes occurred during the following year. The northern and southern sides of the glacier reacted very differently to elevation changes caused by glacier flow during the periods 1961-62 and 1962-63. It is possible that the profile of the whole glacier tongue can rise from 1 yr to the next, but it is not possible that its whole surface can fall. It is also possible that the ice flow from above 1390 m above sea level is balanced by a rise of the ice surface over areas which lie far outside the longitudinal profile. -- BLE

SIP 22378

551.321:528:779(\*57)

Schytt, Valter  
NOTES ON GLACIOLOGICAL ACTIVITIES IN  
KEBNEKAISE, SWEDEN - 1963. VARIATIONS OF  
THE EXTENT OF SWEDISH GLACIERS: FIELD  
WORK 1963. Geografiska Annaler, 45(4):296-299  
incl. illus., 1963.  
DLC, G25.G4

Various steps have been taken during 1963 to increase the number of Swedish glaciers for which annual snout-position measurements are made. During the spring of 1963 the Kiruna Glaciological Club was founded by a number of interested laymen who will make simple routine observations at certain glaciers. The Swedish Air Force photographed about 40 glaciers as a part of their normal training program. On Aug. 31, 1963, fixed points were established at 6 new glaciers: 1 in Kebnekaise and 5 in the mountains further north. The observations at these glaciers were made between 9 a.m. and 5 p.m. with the help of a chartered helicopter. The most pertinent facts about the fixed points are given. -- BLE

SIP 22379

582.26:581.132(\*881)  
551.326.7(\*881)

Bunt, J. S.  
PRIMARY PRODUCTIVITY UNDER SEA ICE IN  
ANTARCTIC WATERS. 1. CONCENTRATIONS  
AND PHOTOSYNTHETIC ACTIVITIES OF MICRO-  
ALGAE IN THE WATERS OF MCMURDO SOUND,  
ANTARCTICA. p. 13-26 incl. tables, graphs, map.  
(In: Milton O. Lee (ed.), Biology of the Antarctic  
Seas, Washington, Amer. Geophys. Union, Antarc-  
tic Res. Series, vol. 1 (Nat. Acad. Sci.-Nat.  
Res. Council Publ. No. 1100, 1964). 20 refs.  
DLC, QH199.L4

Large quantities of microalgae have been recovered from waters extensively covered with thick sea ice in McMurdo Sound. Chlorophyll *a* concentrations were commonly much greater than in waters with a relatively weak ice cover at Mawson Station, where a peak concentration of about  $4 \text{ mg/m}^3$  was found. During the 1961-62 and 1962-63 summers, phytoplankton rich in *Phaeocystis* appeared abruptly, not only at the surface but also throughout the water column in McMurdo Sound. This event coincided with widespread deterioration of sea ice north of Ross Island. During 1961, the introduction of phytoplankton was traced from its appearance at Cape Royds to its arrival several days later at a station about 30 mi farther south. The colonies of *Phaeocystis* were large and well developed, although large proportions of the constituent unicells were incapable of fluorescence when exposed to ultraviolet light in microscope preparations. Their condition contrasted strikingly with the obviously healthy state of the associated populations of diatoms, raising the question whether the same origin was shared by all

elements within the planktonic community. Future efforts should be made to determine the association of Phaeocystis with the disruption of sea ice. -- JFS

SIP 22380 582, 26:581, 132(\*881)  
551, 326, 7(\*881)  
Bunt, J. S.  
PRIMARY PRODUCTIVITY UNDER SEA ICE IN  
ANTARCTIC WATERS. 2. INFLUENCE OF LIGHT  
AND OTHER FACTORS ON PHOTOSYNTHETIC  
ACTIVITIES OF ANTARCTIC MARINE MICRO  
ALGAE. p. 27-31 incl. graphs. (In: Milton O.  
Lee (ed.), Biology of the Antarctic Seas. Washing-  
ton, Amer. Geophys. Union, Antarctic Res. Series,  
vol. 1 (Natl. Acad. Sci.-Natl. Res. Council Publ.  
No. 1190, 1964). 5 refs.  
DLC, QH199.L4

Studies were carried out in McMurdo Sound during the 1962-63 summer, using a C-14 technique, to examine the effects of light intensity, salinity, and temperature on photosynthetic activity of sea-ice algae and planktonic material below the sea ice. Data for Arctic summer plankton from 50 m are included for comparison. The McMurdo populations exhibit a degree of 'shade' adaptation apparently well in excess of that achieved by the Arctic summer plankton, even though the McMurdo material was recovered from the same depth. Light saturation was reached at about 100 ft-candles. A single experiment conducted at about 65 ft-candles showed that net carbon fixation by microalgae from the sea-ice habitat was markedly temperature-dependent, particularly in the range 1.5° to +5°C. Maximum activity was recorded between 10° and 15°C, with a rapid decline above 15°C. Sea-ice algae reached maximal activity at low chlorinities within the range 7.5-10/mille. Even though the phytoplankton was favored by higher chlorinities, its maximum activity was reached at only 15/mille, significantly below the chlorinity of the main water mass in McMurdo Sound. -- JFS

SIP 22381 551, 326, 022:551, 507, 362, 2:779  
Wark, D. Q. and R. W. Popham  
THE DEVELOPMENT OF SATELLITE ICE SUR-  
VEILLANCE TECHNIQUES. p. 415-418 incl. illus.  
(In: H. Wexler and J. E. Caskey, Jr. (eds.),  
Rocket and Satellite Meteorology. Proc., 1st.  
Internatl. Symposium on Rocket and Satellite  
Meteorol., Washington, D. C., April 23-25, 1962.  
North-Holland Publ. Co., 1963). 3 refs.  
DLC, QC879.S.157

The development of a program for using meteorologi-  
cal satellites to observe sea ice is presented, and  
the capabilities and limitations of this program are  
explored. Examples of satellite photographs of sea

ice obtained from 3 TIROS satellites are shown and  
some of the features discussed. A joint U. S. -  
Canadian experiment to gather comparative data for  
studying and developing satellite ice surveillance  
techniques is reviewed. Complete and continuing ice  
reconnaissance from satellites must await the Nim-  
bus series, which will be earth-oriented and in  
quasi-polar orbits, but the lessons learned from the  
TIROS and aircraft observations will be invaluable  
in hastening the regular charting of ice over both  
polar regions from satellite photographs. (Authors'  
abstract, modified)

SIP 22382 551, 578, 42:551, 507, 362, 2:779

Fritz, Sigmund  
SNOW SURVEYS FROM SATELLITE PICTURES.  
p. 419-421 incl. illus. (In: H. Wexler and J. E.  
Caskey, Jr. (eds.), Rocket and Satellite Meteorology.  
Proc., 1st Internatl. Symposium on Rocket and  
Satellite Meteorol., Washington, D. C., April 23-  
25, 1962. North-Holland Publ. Co., 1963). 1 ref.  
DLC, QC879.S.157

Satellites can see white snow fields against darker  
background. Moreover a snow field can be distin-  
guished from clouds, which also appear white in  
satellite pictures, when pictures are taken on suc-  
cessive days. Cloud patterns change continually  
from day-to-day, but the snow fields generally re-  
main unaltered over a period of a few days. This is  
illustrated with a series of TIROS IV snow-cover  
pictures over mountains in southern South America  
and western North America. To evaluate the snow  
covered areas quantitatively, it is necessary to pro-  
vide an accurate geographic overlay for the pictures.  
This should be easy when identifiable river valleys  
or lakes are discernible in the pictures. Therefore,  
with the aid of satellite cloud pictures it is possible  
to delineate the snow-covered areas with considera-  
ble accuracy. By computing the change in the area  
from week to week or month to month during the  
snow-melt season, observational data would be pro-  
vided for use in storage estimates and as an aid in  
flood forecasting. -- BLE

SIP 22383 551, 345(\*50)  
Shumskiy, P. A.  
GROUND [SUBSURFACE] ICE. (Podzemnye l'dy;  
Text in Russian). p. 274-327 incl. illus., diagrs.,  
maps. (In: Akad. nauk SSSR. Osnovy geokriologii  
(merzlotovedeniya), Chast' pervaya, Obshchaya  
geokriologiya, Glava 9, 1959). 456 refs. (Eng.  
transl.: Natl. Res. Council, Can., Tech. transl.  
1130, 1964).  
DLC, GB641.A6

The highlights in the history of ground ice investiga-  
tions are reviewed which were begun in the eight-  
eenth century. Emphasis is placed on the theory of

vein ice formation and the burial of surface ice, the history of the firn-glacial hypothesis of ground ice formation, and the classification of ground ice which includes segregated ice, injected ice, vein ice, recurrent vein ice, cave ice, thermokarst cave ice, karst cave ice, buried ice, and surface ice. The modes of origin, characteristics, properties, and geographical distribution of each of these types are discussed in detail. It is concluded that ice is a component of frozen soil and governs its basic properties. With respect to the surrounding soil, ground ice can be epigenetic when it originates in soil already existing, and syngenetic when its formation is simultaneous with the surrounding strata. According to its genesis, 3 basic groups of ground ice should be distinguished: constituted, cave vein, and buried ice. The first is the product of the freezing of ground water, the second, the filling of cavities in the frozen soil, and the third, the burial of surface ice. The greatest quantity of ground ice is formed from water penetrating unfrozen soil and subsequently freezing there. -- BLE

SIP 22384 551.511.6:551.524.4:551.554

McVehil, G. E.  
WIND AND TEMPERATURE PROFILES NEAR THE GROUND IN STABLE STRATIFICATION. *Quart. J. Roy. Meteorological Soc.* 90(384):136-146 incl. tables, graphs, April 1964. 17 refs.  
DLC, QC851.R8

Observed wind and temperature profiles from O'Neill, Nebraska and Antarctica are analyzed to determine their characteristics in inversion conditions. Analyses of the similarity of wind and temperature profiles are presented. These show that the profiles are generally similar when the Richardson number is small. However, there is strong evidence in the Antarctic data for a departure from similarity and a decrease in the ratio of eddy conductivity to eddy viscosity for Richardson numbers greater than 0.08. It is shown that the log-linear wind profile fits the observations well for Richardson numbers less than 0.14. The constant in the log-linear equation has a value of 7 in stable air, implying a critical gradient Richardson number of 1/7. From the log-linear theory, heat flux and surface stress can be calculated given winds at 2 levels and the surface roughness. Predicted values are compared with observations. The agreement is good in the case of surface stress and fair for heat flux. (Author's summary)

SIP 22385 551.594.5:550.38(\*2)

Maeda, Kaichi and Tomiya Watanabe  
PULSATING AURORAE AND INFRASONIC WAVES IN THE POLAR ATMOSPHERE. *J. Atmos. Sci.* 21(1):15-29 incl. tables, graphs, diags., appendix, Jan. 1964. 37 refs.  
DLC, QC851.A283

Pulsating aurorae are proposed as a source of the infrasonic waves associated with geomagnetic activity reported by Chrzanowski, et al. One of the most plausible mechanisms for generating these long-period pressure waves is the periodic heating of the upper air around the 100-km level by auroral bombardment during pulsating visual aurorae. To see the energetic relation between source input and pressure change at sea level, some theoretical calculations are performed with a simple model of auroral distribution in an isothermal atmosphere. At least 100 erg/cm<sup>2</sup>/sec of energy flux variation at auroral height is necessary to produce surface pressure amplitudes of the order of 1 dyne/cm<sup>2</sup> in this model. The intensity of the pressure waves in this model decreases rapidly outside of the region of auroral activity, indicating the importance of sound-ducts in the upper atmosphere for the propagation of these long period sonic waves. (Authors' abstract)

SIP 22386 551.509.617:547:551.508.76+.91

Langer, G., J. Rosinski and S. Bernsen  
ORGANIC CRYSTALS AS ICING NUCLEI. *J. Atmos. Sci.* 20(6):557-562 incl. table, diag., Nov. 1963. 11 refs.  
DLC, QC851.A283

Laboratory work showed that organic compounds have considerable promise as cloud-seeding agents. The following substances gave complete nucleation: phloroglucinol at -2°C, trichlorobenzene at -12°C, D(+)-Raffinose at -14°C, trimelic acid at -15°C, and melamine at -15°C. Thirty-two organic compounds were investigated. The tests were conducted in a deepfreeze cloud chamber and a Bigg-Warner chamber. Field tests confirmed the activity of phloroglucinol. Theoretical analysis indicates that activity of organic icing nuclei is determined by the configuration of electric link-dipole moments in the molecule. (Authors' abstract)

SIP 22387 551.509.617:547.53

Braham, Roscoe R., Jr.  
PHLOROGLUCINOL SEEDING OF UNDERCOOLED CLOUDS. *J. Atmos. Sci.* 20(6):563-568 incl. illus., tables, graph, Nov. 1963. 10 refs.  
DLC, QC851.A283

A series of 12 releases of phloroglucinol were made into stratus clouds at temperatures of -7°C to -17°C. Showers produced by dry-ice seeding were used to identify particular spots in the layer clouds from which the exact locations of the phloroglucinol releases could be obtained by simple navigation. Visual observations of the cloud behavior and Formvar replicas of cloud and precipitation particles provided a means for judging the effects of the phloroglucinol. It is concluded that phloroglucinol will induce the formation of ice in undercooled clouds. However, in these experiments, it was not

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nearly as effective as the dry ice in causing shower formation. (Author's abstract)

SIP 22388 551,509,617:551,508,76+.91(77)

Bourquard, A. Don  
ICE NUCLEUS CONCENTRATIONS AT THE  
GROUND. J. Atmos. Sci. 20(5):386-391 incl.  
tables, graphs, Sept. 1963. 6 refs.  
DLC, QC851.A283

Daily observations of the surface concentration of ice nuclei were made during the summers of 1960, 1961, and 1962 in Missouri as a part of Project Whitetop. The Bigg-Warner ice nucleus counter (an expansion type instrument) was used whereby a sample of ambient air is introduced into a cold chamber held at a constant temperature of about  $-10^{\circ}\text{C}$ . The sample is then pressurized and allowed to come into temperature equilibrium with the chamber after which it is allowed to expand rapidly in a nearly adiabatic fashion. The ice nuclei thus formed fall into a super-cooled sugar solution in the bottom of the chamber where they grow and can be counted visually. Ice nucleus counts varied considerably from day to day and from hour to hour; they were greater during periods with southerly winds and high amounts of precipitable water overhead. The possible effects of cloud seeding in the area were also analyzed. Seeding was accomplished with silver-iodide smokes from aircraft at distances of 25 to 45 m from the nucleus counter. The seeded periods showed a slightly increased nucleus count at the ground, but the increase was small when compared with natural variations in the nucleus count. The slight increase in count during cloud seeding may persist into the following day. -- BLE

SIP 22389 551,322:536,4,031

Pruppacher, Hans R. and M. Neilburger  
THE EFFECT OF WATER SOLUBLE SUBSTANCES  
ON THE SUPERCOOLING OF WATER DROPS. J.  
Atmos. Sci. 20(5):376-385 incl. tables, graphs,  
Sept. 1963. 25 refs.  
DLC, QC851.A283

New experiments on the supercooling of aqueous solutions were carried out with a special experimental technique whereby 3 types of water purification were used. In the first series of experiments, solution drops were frozen at the tip of a thermocouple which was covered with a thin glass sleeve coated with silicone oil. To avoid the effect which the solid surface on which the drops were hanging and the air surrounding the drops have on the freezing temperature, the drops were placed at the interface of  $\text{CCl}_4$  and paraffin oil in the second series.

In this case, the freezing temperature was affected by a mixing of the liquids. This was avoided in the third series of experiments by suspending the drops at the interface of Fluorochemical-75 and a specially refined paraffin oil. All solutes investigated enhanced the supercooling of pure water. The non-equilibrium freezing point depression  $(\Delta t)_f$  increased with increasing concentration of the solute. A comparison of  $(\Delta t)_f$  with the sum of the equilibrium freezing point depression  $(\Delta t)_e$  and the supercooling of water  $(\Delta t)_w$  showed that there was in general a small difference which expressed the additional effect of the dissolved substance on the formation of ice-like clusters over and above the usual vapor pressure effects which are contained in  $(\Delta t)_e$ . The results are compared with those reported by various authors in recent literature and are used to discuss the ice-forming mechanism in the atmosphere. -- BLE

SIP 22390 551,578,7:551,576,11(77)

Koenig, Randall L.  
THE GLACIATING BEHAVIOR OF SMALL CUMULONIMBUS CLOUDS. J. Atmos. Sci. 20(1):29-47 incl. illus., tables, graphs, Jan. 1963. 21 refs.  
DLC, QC851.A283

Data gathered during consecutive traverses through summer clouds in southern Missouri have been interpreted to indicate that: (1) the glaciating characteristics of commonly occurring small cumulonimbus clouds in this region are dependent upon the size distribution of the liquid phase prior to the inception of glaciation; (2) clouds having large liquid-water drops, rapidly form high concentrations of ice particles regardless of the concentrations of foreign ice-forming nuclei; (3) the ice phase within the clouds does not begin anew; it builds upon the size distribution that has been achieved by the liquid phase and consequently a continuous modification of the particle size distribution within the cloud occurs; and (4) coalescence continues to be a dominant growth mechanism, and growth by sublimation is essentially by-passed. The data appear to be compatible with a chain-reaction process propagated by the formation of satellite ice particles during the solidification of water drops. (Author's abstract)

SIP 22391 550,389(+682)

Ostenso, Ned A. and Perry E. Parks, Jr.  
SEABORNE MAGNETIC MEASUREMENTS IN THE  
CHUKCHI SEA. Wisc. Univ., Geophys. and Polar  
Res. Center, Dept. of Geology, Res. Rept. No. 64-  
5, 31p. incl. illus., diags., maps, June 1964. 26  
refs.  
DLC, Tech. Rept. Collection

This report discusses the physiography of the Chukchi Shelf, previous and future geophysical investigations in the area, and the field program of

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the seaborne magnetic survey during the 1962 post-season oceanographic cruise of the USCGC Northwind. The equipment used included the Univ. of Wisconsin's magnetic observer, the V-4931 modular station magnetometer, and the Braincon towed vehicle ("fish"). The data indicate that the feature causing the magnetic and gravity anomalies is a major structural element which is at least 600 km long and 100 km wide. This feature of dense rock with high magnetic susceptibility is a major building-block in the structure of the Chukchi Shelf. Because the magnetic and gravity anomalies appear to extend undiminished to the Siberian mainland they may be reflecting a northeastward extension of the Precambrian Anabar shield. Magnetic anomalies within the zone of disturbance exceed 750 gammas in amplitude and possess gradients as steep as 0.43 gammas/m of horizontal distance. If this magnetically disturbed zone does extend to the Siberian coast, its implications to the detection of submarine traffic by magnetic methods may be profound. -- BLE

SIP 22392

551,345, 1(\*428+\*440)

Brown, R. J. E.  
PERMAFROST INVESTIGATIONS ON THE  
MACKENZIE HIGHWAY IN ALBERTA AND  
MACKENZIE DISTRICT. Tech. Paper No. 175,  
Div. Building Res., Natl. Res. Council, Can. 27p.  
incl. illus., tables, graphs, diagr., maps, appendix, June 1964. 23 refs.  
DLC, Tech. Rept. Collection

Observations were made during Sept. 1962 to delineate the bodies of permafrost and to relate their distribution to relief, drainage, vegetation and soil type. The climate of the area, its geology, and aerial photography patterns are discussed. An aluminum Hoffer probe and a 1-1/2 in. screw-type soil auger with 3-ft extensions were used to determine the depth of permafrost and soil profiles in permafrost-free areas. In frozen ground consisting of peat or fine-grained mineral soils, holes were made to depths of 10-15 ft by chopping downward with an ice chisel attached to a 3/4-in. pipe; frozen chips of soil were removed with a 4-in. posthole auger. The distribution of permafrost along the Mackenzie Highway between Hay River, N.W.T., and Keg River, Alberta, is patchy and erratic. It occurs only in low areas and in some of the river valleys tributary to the Hay River. The absence of permafrost between High Level and Keg River is related to the widespread poor drainage along this section of the Mackenzie Highway. The three occurrences of permafrost between High Level and Meander River are restricted to the only three Sphagnum areas between these two settlements. South of Hay River the terrain factors are the most important in determining the presence of permafrost at a particular location. -- BLE

SIP 22393

541,15:551,322:547(024)

Sharpaty, V. A.  
RADIOLYSIS OF FROZEN AQUEOUS SOLUTIONS.  
(Radioliz zamorozhennykh vodnykh rastvorov; Text in Russian). Uspekhi khimii, 32(6):737-753 incl. tables, 1963. 71 refs.  
DLC, QD1.U7

This review of published results in radiation chemistry deals with the effect of ionized radiation on frozen aqueous solutions and the determination of primary products and redistribution of absorbed energy in water radiolysis. The kinetics of end product accumulation from radiative chemical changes in ice and solid aqueous solutions are treated. Intermediate products of radiolysis are identified and properties investigated by fluorescent and thermoluminescent methods. The influence of admixtures on the behavior of radicals formed during radiolysis of ice is described. Experimental conclusions indicate: (1) that reorientation of active particles develops at low temperatures and affects the yield of radiolysis products in frozen solutions; (2) that reaction of H and OH radicals formed during radiolysis with solutes determines the nature of solute changes; and (3) that solute anions stabilize the radicals formed from water and agents with radical affinities enhance the formation of radical products. -- ES/FMM

SIP 22394

528,37(\*745/\*747)

Lazarev, G. E.  
TRIGONOMETRIC LEVELING ALONG THE TRAVERSE KOMSOMOL'SKAYA-SOVETSKAYA-VOSTOK-KOMSOMOL'SKAYA. (Trigonometricheskoe nivelirovaniye na profile Komsomol'skaya-Sovetskaya-Vostok-Komsomol'skaya; Text in Russian). Geofizicheskiy Zhurnal, No. 13:49-56 incl. illus., table, 1963. ref.  
DLC, QC801.3.M4

This report describes terrain, weather, trail conditions, equipment performance, and trigonometric leveling on a 1540-km traverse in Antarctica. Cold temperatures caused lubrication problems in instruments and difficulties in readings of the level on the vertical circle of the OT-02 theodolite. The mean square error in readings on the rod at a distance of 2000 m was less than  $\pm 25$  mm; using a NV leveling instrument the error in closure of a triangular polygon with a mean side length of 2600 m was  $\pm 14$  mm; the error in determination of relative elevations between two closely-spaced control points from a distance of 2700 m was 2 mm. The influence of refraction is minimal from 0600 to 2000 hr. Error of closure of the resulting polygon was  $\pm 5.6$  m; the mean square error at the center of the traverse was  $\pm 2.9$  m. Both trigonometric and geometric leveling over a distance of more than 1500 km was found to be satisfactory, with a rate of progress of up to 65 km/day. The importance of a tie-in of the traverse to a second coastal control point is emphasized.

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Coordinates and elevations of the stations established along the traverse are tabulated. (JPRS abstract)

SIP 22395

551.321.5:528.7

Cheremnykh, G. D.  
NEW DEVELOPMENTS IN THE MEASUREMENT OF THE RATE OF MOVEMENT OF ICE IN THE SURFACE PARTS OF GLACIERS AS SHOWN BY AERIAL PHOTOGRAPHS. (Novoe v izmerenii skorostei dvizheniya l'da v poverkhnostnykh chastyakh lednikov po materialam aeros"emki; Text in Russian). Geodeziya i aerofotos"emka, No. 5:111-115, incl. table, diag., 1962. 3 refs. (Eng. transl.: Geodesy and Aerophotography, No. 5:342-344, 1962, publ. 1963).

DLC, Unbound periodical

Movement studies of Antarctic glaciers were made on aerial photographs taken 12-1/2 months apart in 1956-57. Analysis of the cartograms, using the plane phototriangulation method, showed an accuracy almost equal to that of ground determinations, but the aerial method is superior in the number of simultaneously-possible determinations. Subsequent work has shown that increased accuracy can be achieved by using aerial negatives reduced by the spatial phototriangulation method. The latter method was used on photographs taken 600 days apart in 1957-58 of an outlet glacier near Chugunov Island [Queen Mary Coast, Antarctica]. The negatives were reduced on an SD-1 universal stereophotogrammetric instrument. As shown on a text map, the non-coincidence in the positions of identical planimetric points shows evidence of movement. A discussion of the accuracy of operation of the stereograph is included. -- JFS

SIP 22396

551.324.65(235.21)

Dolgushin, L. D. and others  
THE RECENT ADVANCE OF THE MEDVEZHII GLACIER. (Nedavnee nastupleniye lednika Medvezh'ego; Text in Russian). Priroda, No. 11:85-92 incl. illus., table, diag., 1963. (Eng. transl.: Defence Res. Board (Can.), Rept. No. T 409 R, Oct. 1964).

DLC, Q4, P8

On April 22, 1963, the Medvezhii Glacier (in the basin of the Vanch River in the Pamirs) began to move rapidly along the Khirsara Valley at speeds as high as 100 m/day, i.e., its speed increased by 200 times. The glacier tongue, thrusting 9 km forward, is broken by a system of fissures. The glacier behaves differently on the outside of the great fractures. The layers of fragmented ice enriched by the moraine are distorted into a complicated folding. By the end of May the upper part of the glacier

tongue had settled and not even the crests of the waves rose above the level of the former glacier surface. At the beginning of June, the lake which formed behind the glacier had attained a depth of 80 m and a volume of 20-25 million cubic meters. The danger presented by this water and its eventual flooding are described. A probable cause of the thrusts is a change in the internal friction of the ice as a result of increased loading and a large decrease of the bottom friction when the bottom-ice temperature passed through 0°C and melting began. -- BLE

SIP 22397

551.32(\*784.2)

Bauer, R.  
PRELIMINARY OUTLINE OF THE SCIENTIFIC WORK OF THE SUMMER SEASON 1961-1962 IN KERGUELEN ISLANDS. GLACIOLOGY. (Premier aperçu sur les travaux scientifiques de la campagne d'été 1961-1962 aux îles kerguelen. Glaciologie; Text in French). TAAF, No. 18:30-33, incl. illus., Jan.-March 1962.

DLC, G845, F7

Study of Kerguelen's glaciation was the object of a general program which included reconnaissance, mapping, identification, and census of glaciers, and an estimate of the elevation of equilibrium line and the order of magnitude of annual accumulation. A helicopter was used for the investigations and for taking black-and-white and color photographs. The glaciers investigated are listed; they show recent net recession although most of the ice fronts appear to be very active. -- GAD

SIP 22398

55(\*762+\*764)

Cailleux, André  
GEOLOGICAL STUDY OF McMURDO SOUND REGION (ANTARCTICA). (Études de géologie au détroit de McMurdo (Antarctique); Text in French with English summary). CNFRA, No. 1, 41p. incl. illus., tables, map, 1962. 21 refs.

DLC, GPRR

Strong wind-action was observed in the Beacon sandstone and in sand grains of Quaternary and recent deposits. In Victoria Valley, in addition to sand dunes, there are niveo-eolian deposits with much lesser slopes, and made up of interstratified sand and snow. Erosion of pebbles is slight, as shown by their roundness index, and is the result of the lack of abundant meltwater. Unusual varieties of quartz—round, shiny, limpid grains about 0.2-0.3 mm in diameter—have been found in the McMurdo Station area and appear to result from volcanic activity, as shown by a sample from Castle Rock. The coarseness of the deposits is much greater in the Quaternary meltwater deposits of Victoria Valley (first centile, 20-100 mm) than in the present-day sandy deposits (first centile, 1-3 mm). This implies that

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during parts of the Quaternary, the amount of melt-water, though unable to round the pebbles, must have been greater than at present. (Author's abstract, modified)

SIP 22399 546.11.02.2:551.321:551.322(\*7)

Lorius, C.  
DEUTERIUM. POSSIBILITIES OF APPLICATION TO RESEARCH PROBLEMS CONCERNING SNOW, NÉVÉ AND ICE IN THE ANTARCTIC. (Le deutérium. Possibilités d'application aux problèmes de recherche concernant la neige, le névé et la glace dans l'Antarctique; Text in French). CNFRA, No. 8, 102p. incl. illus., tables, graphs, diagrs., maps, 1963. 72 refs.  
DLC, GPRR

The observations and samples on which this work is based were made in 1959-1960 in Victoria Land, and 1961-1962 in Adélie Coast. The paper comprises 6 chapters supplemented by numerous tables and figures. The topics include the stable isotopes, deuterium content in snow, snow accumulation measurement and seasonal dating of névé layers by deuterium, relation between mean annual temperatures and isotopic concentrations, characterization of the origin of ice, and a general discussion on the utilization of stable isotopes in glaciological studies. The two main uses of the latter are in the study of mass balance and its evolution, and the study of climatic variations. -- GAD

SIP 22400 551.321:539.155.2(\*2)

Lorius, C.  
THE UTILIZATION OF ISOTOPES IN THE GLACIOLOGIC STUDY OF POLAR ICE CAPS. (L'utilisation des isotopes dans l'étude glaciologique des calottes polaires; Text in French). TAAF, No. 25:4-21, incl. graphs, diagrs., Oct.-Dec. 1963. 23 refs.  
DLC, G845. F7

Isotopes are either radioactive or stable, of which the radioactive isotopes are essentially utilized in glaciology for absolute age dating or as markers for particular horizons. Absolute age determinations are made with Pb 210 and C14, while particular horizons in the stratified snow are marked with accumulations of radioactive fallout from nuclear explosions. The stable isotopes utilized in glaciology are deuterium and oxygen 18. Due to the seasonal variation in the isotopic content of snow, it is possible to count the years in successive beds, and the accumulation values thus obtained agree with those deduced from stratigraphic analysis. The stable isotopes were also used to determine the origin of ice in icebergs and ice caps. It appears that stable isotopes can be used to determine the precipitation, snow accumulation, movement (y-

namics of ice caps, accumulation zones in mass balance studies, secular temperature variations, and melting at the bottom of the ice. -- GAD

SIP 22401 551.351:551.735/.736(\*7)

Ahmad, F. and N. Ahmad  
THE AGE OF THE GONDWANA GLACIATION. Proc. Natl. Inst. Sci. India, Pt. A, 28(1):16-56 incl. tables, Jan. 28, 1962. 75 refs.  
DLC, Q73.N3

The stratigraphic and paleontologic record of the Permian System in Gondwanaland is examined, with particular stress on the age of the basal tillites. The term *Glossopteris* flora has been rather loosely used in the past and the austral Permian flora is, herein, described as the *Gangamopteris* flora in the Lower Permian, and the *Glossopteris* flora in the Middle and Upper Permian. The appearance, predominance, decline and finally the disappearance of the former genus, as a whole, are more important indicators of age than the presence or absence of any one genus or species. The various possibilities under which glaciation could have occurred in such widespread areas are discussed and it is pointed out that drift provides a reasonable working hypothesis. Anomalies in paleontological, stratigraphic and glacial records are then sought and it is suggested that the only explanation is that glaciation was not simultaneous in all the areas, and there was a considerable time-lag between refrigeration in one area and another. Glaciation, presumably, started in the Permo-Carboniferous in eastern Australia, and might have ended in the upper Middle Permian in South Africa, and somewhat later in Tasmania. The evidence suggests that there, apparently, was no ice age, and instead the Gondwanaland continent itself was drifting on the South Pole before it started splitting up. (Authors' abstract modified)

SIP 22402 551.509.324.2:551.577.37(52)

Miyazawa, Seiji  
STUDY ON THE HEAVY SNOWFALL IN HOKURIKU DISTRICT - FORECASTING OF THE SO-CALLED SATO YUKI. (Hokuriku chihō no gosetsu ni tsuite - sato yuki no yohō kenō; Text in Japanese with English summary). Kishōcho kenkyū jihō (Journal of Meteorological Research), 14(10):9-34 incl. tables, graphs, diagrs., maps, Oct. 1962. 23 refs.  
DLC, Orientalia Div.

The heavy snowfall [so-called "Yama Yuki" in the mountain and "Sato Yuki" in the plain] from Dec. 26, 1960, to Jan. 1, 1961, in the Hokuriku district was analyzed using synoptic data, mesoscale, and reconnaissance flight data. The synoptic conditions of heavy snowfalls are investigated statistically in relation to the mesoscale pressure distribution, and quantitative estimations of snowfall are made. The

# CRREL BIBLIOGRAPHY

results obtained are as follows. (1) The upper cold vortex around the Japan Sea is a major cause of the heavy snowfall in the Hokuriku front as well as for the heavy rainfall in the Bai-u front. The vortex causes the convective instability. (2) Based on the mesoscale analysis, snowfall is frequently accompanied by instability lines and small pressure disturbances with thunderstorms. Therefore, locating and tracing isallobaric lows in the mesoscale, surface convergence, and radar echoes will aid in forecasting the movement of heavy snowfall areas. (3) The effect of surface convergence, topography, large scale disturbance, and convective instability on the amount of snowfall is estimated. The predicted results agree with the observations. (Author's abstract, modified)

SIP 22403 551.524.4:551.521.3(52)

Rikitake, T.  
ON THE HEAT BUDGET OF THE COLD LAYER NEAR A BARE SOIL SURFACE AT NIGHT. (Yakan hadakachi hyomen fukin ni arawareru kanreisō no natsushishi ni tsuite; Text in Japanese with English summary). Kishōchō kenkyū jiho (Journal of Meteorological Research), 14(10):36-42 incl. tables, graphs, diagrs., Oct. 1962. 7 refs.  
DLC, Orientalia Div.

Soil temperature profiles in the 10- to 30-cm layer (the cold layer) suggest that minimum air temperatures occur above rather than at the soil surface. This is demonstrated most clearly over a bare soil surface on a windless night. The amount of radiative cooling in the cold layer is estimated in this paper, based on the results of an earlier investigation of the relation between the reflectivity of long wave radiation from the soil surface and the thermal properties of the cold layer. It is concluded that the reflectivity of the bare soil surface has a considerable effect on the formation and maintenance of the cold layer. However, the effect of conduction in the cold layer is greater than that of the radiative cooling; therefore, the ground surface conditions must also be taken into consideration. (Author's abstract, modified)

SIP 22404 621.315.1:551.574.42(52)

Sasaki, S.  
SNOW ACCUMULATION ON POWER LINES IN EASTERN HOKKAIDO. (Dōtō no densen chakusut-subyō; Text in Japanese). Hokkaidō no Kishō (Weather in Hokkaidō), 8(4):3-4 incl. graphs, April 1964.  
DLC, Orientalia Div.

This article discusses temperature, wind speed, and atmospheric pressure at Kushiro, Hokkaido, during the winters of 1962 and 1963, and describes the occurrences of snow accumulation on power lines,

glaze, and ice fog. Snow accumulation on power lines often exceeded 10 cm in diam. (which corresponds to 4.4 tons of pressure per span) and caused breakage of power lines and poles in both years. -- CST/BLE

SIP 22405 551.579.2:551.521:535.23(52)

Ishikari-Humata Weather Forecasting Station  
GREEN ASH AS A THAW PROMOTER. (Yusetsu sokushinsei toshitenō gurin ashu; Text in Japanese). Hokkaidō no Kishō (Weather in Hokkaidō), 8(4):8 incl. tables, April 1964.  
DLC, Orientalia Div.

Soil, fine coal, green ash, and coal ash were tested as thaw promoters on a snow covered field at Numata, Hokkaido, on March 7 and 13, 1964. Green ash (a by-product of coal power stations) is composed of silicic acid, Fe, lime, and potash. It was spread at the rate of 0.5-1.5 kg/are. The results indicate that soil is the most effective thaw promoter followed by fine coal, green ash, and coal ash, respectively. The effectiveness of green ash depends on the amount spread; 1 kg/are was as effective as soil. -- CST/BLE

SIP 22406 551.343:661(52)

Koyama, M., T. Takahashi and Y. Kawai  
ON THE FROST HEAVE TEST OF SOIL MIXED WITH CHEMICALS. (Yakuzai o konnyū shita tsuchi no tōjō jikken ni tsuite; Text in Japanese). Hokkaidō Kaihatsukyoku Doboku Shikenjo Geppō (Hokkaido Bureau of Resources, Monthly Rept. Civil Eng. Testing Lab.), No. 122:10-13 incl. tables, graph, diagrs., Aug. 1963. 2 refs.  
DLC, Orientalia Div.

Tests were made of the effect of mixing soils with chemicals on frost heaving. The chemicals used were CaCl<sub>2</sub>, NaCl, cement, slaked lime, a soil stabilizer (MgCl<sub>2</sub>) and 4 soil improvers. A sample containing 1-5% chemicals was tamped to a minimum density in a cylindrical mold (3 cm high, 8 cm diam) and left at room temperature to absorb underground water through porous stone for 24 hr. The air temperature was -4°C and the subsurface water temperature was 3°C. Frost heave ratio, the centrifugal equivalent of the water content, and plasticity as functions of chemical concentration were studied. It is concluded that the method is suitable for thin roadbeds or deep frost heaving. -- CST/BLE



SIP 22407 551.324.431:551.578.4:551.510.721(\*701)

Picciotto, E. and G. Croxas  
RATE OF ACCUMULATION OF SNOW AT THE  
SOUTH POLE AS DETERMINED BY RADIOACTIVE  
MEASUREMENTS. *Nature*, 203(4943):393-394 incl.  
table, graphs, July 25, 1964. 9 refs.  
DLC, Q1.N2

Estimations of the rate of accumulation of snow at the South Pole published so far are based on stratigraphic observations, direct measurements (carried out, since 1957, on stakes placed in the vicinity of the station), and variations in the oxygen isotope ratio. This article presents the results of stratigraphic observations and of measurements of fission products and Pb-210. The average annual accumulation deduced for the period 1951-1962 is 7.5 cm of water. For the period 1955-1962, for which the stratigraphy is more clearly marked, the average annual increase is 6.3 cm. According to the results obtained at the King Baudouin Base, the sudden increase in the  $\beta$ -activity noted above the -145-cm level should correspond to early 1955. The results herein reported confirm this conclusion and are in good agreement with the stratigraphic interpretation of the upper 140 cm. The accumulation rate of water and the initial activity of Pb-210 in the snow have remained constant over the past 100 yr. The three methods lead to a mean value of annual accumulation of 6-7 cm. -- BLE

SIP 22409

551.338:551.79

Hollin, J. T.  
ORIGIN OF ICE AGES: AN ICE SHELF THEORY  
FOR PLEISTOCENE GLACIATION. *Nature*, 202  
(4937):1099-1100, June 13, 1964. 7 refs.  
DLC, Q1.N2

An evaluation of a theory by A. T. Wilson [SIP 21931] that thermal surges of the Antarctic ice sheet initiate glaciation in the Northern Hemisphere shows that many assumptions (glaciological, oceanographical, and meteorological) are required to validate the theory. Instead, field evidence may be used as proof, although in Antarctica, the evidence is inconclusive. In other parts of the world, cyclothems may be the result of surges of the ice shelf theory, and, if so, temperature determinations of marine cyclothem fauna should show a warm-cold-warm sequence, particularly in the Tertiary of the Southern Hemisphere. Another outcome of the sea-level variations (if rapid enough) might be large numbers of animals starved or drowned as flooding of lowlands occurred. In England, for example, the marine deposits called the Craggs do contain at their bases unusually rich vertebrate and other fossil beds. To strengthen the concept that these glacial-marine surges occurred, proof is required that the surges were large enough (10-30 m), and that they occurred at particular times, e.g., at the end of the interglacial ages and the beginning of the glacial ages. Such a marine transgression may have occurred in England at the close of the Hoxnian interglacial age. -- JFS

SIP 22410

551.974.7:551.509.3:629.13

Air Weather Service  
FORECASTERS' GUIDE ON AIRCRAFT ICING.  
AWSM No. 105-39, 49p. incl. tables, graphs,  
diagr., map, Sept. 15, 1964. 51 refs.  
DLC, Tech. Rept. Collection

The 3 basic forms of ice accumulation on aircraft are rime ice (a rough, milky, opaque ice formed by the instantaneous freezing of small supercooled droplets as they strike the aircraft), clear ice (a glossy, clear or translucent ice formed by the slow freezing of large supercooled droplets), and frost (a light, feathery deposit of ice crystals which usually forms on the upper surfaces of parked aircraft by radiational cooling in a manner similar to the formation of hoarfrost on the ground). Also discussed are the intensities of icing, de-icing and anti-icing methods, and icing hazards on or near the ground. Physical factors which affect aircraft icing include temperature, the amount of liquid in the path of the aircraft, droplet size, and collection efficiency. The atmospheric distribution of potential aircraft icing is mainly a function of temperature and cloud structure. Non-synoptic forecast aids include radar and radiosonde data, theoretically and empirically determined aerodynamic-heating curves for various aircraft, and statistically determined curves of the

SIP 22408

551.563.5:551.578.4

Hogg, D. C.  
SCATTERING AND ATTENUATION DUE TO SNOW  
AT OPTICAL WAVE-LENGTHS. *Nature*, 203  
(4943):396, incl. graph, July 25, 1964.  
DLC, Q1.N2

The narrow beam-widths obtainable with coherent light permit one to examine forward scattering caused by atmospheric effects in some detail. For example, it is found that inhomogeneities of refractive index in the otherwise clear atmosphere give rise to considerable broadening of a narrow beam. However, when heavy snow is falling, scattering and the ensuing attenuation of the optical wave are caused predominantly by the flakes. This also holds true in propagation through droplets of fog and rain. Although beam-broadening due to snow is a readily measurable effect, its onset occurs when the attenuation is fairly high. Raindrops are more efficient than snowflakes in forward scattering. -- BLE

# CRREL BIBLIOGRAPHY

frequency of aircraft icing as a function of altitude and temperature. Suggested procedures are outlined for forecasting aircraft icing and data are given from a study of dew-point spread and temperature as factors in aircraft icing. -- BLE

SIP 22411

551, 584, 34:187, 7(\*2)

Lettau, H. H.  
CORRESPONDENCE BETWEEN THEORETICAL MODELS AND ACTUAL OBSERVATIONS IN ARCTIC MICROMETEOROLOGY. p. 231-239 incl. table, graphs, diagr. (In: Contributions to the Seminars on the Stratosphere and Mesosphere and Polar Meteorology, July 7-19, 1963, Montreal, McGill Univ., Arctic Meteorol. Res. Group, Publ. Meteorol. No. 65, Contract AF 19(604)-8431, Proj. 8628, Task 862807, Scientific Rept. No. 9, AFCRL 64-197, Jan. 1963). 9 refs.  
DLC, Tech. Rept. Collection

Arctic micrometeorology is primarily concerned with inversion conditions over relatively uniform snow and ice surfaces. The South-Pole data permitted an unusually detailed and systematic analysis of the curvature characteristics of micrometeorological wind and potential temperature profiles. The observed behavior of curvature characteristics cannot be accounted for by a theoretical model of surface layer structure because the real cause must be sought in an effect of momentum-flux divergence. Among the practical applications of micrometeorological surface layer theory, the most frequently demanded information concerns the surface value of convective heat flux density. A new model is suggested for calculating the surface value, which permits the determination of a zero point correction for the anemometer mast, together with the numerical determination of surface roughness and drag and their statistical errors. The estimated value of heat flux at the surface depends on the magnitude of wind shear and temperature gradient close to the interface. -- BLE

SIP 22412

551, 511(\*3)

Vowinkel, E. and Sverre Orvig  
HEAT BUDGET OF THE ARCTIC. p. 241-243. (In: Contributions to the Seminars on the Stratosphere and Mesosphere and Polar Meteorology, July 7-19, 1963, Montreal, McGill Univ., Arctic Meteorol. Res. Group, Publ. Meteorol. No. 65, Contract AF 19(604)-8431, Proj. 8628, Task 862807, Scientific Rept. No. 9, AFCRL 64-197, Jan. 1963). 10 refs.  
DLC, Tech. Rept. Collection

The energy exchange between the earth's surface and the atmosphere was studied for the area north of 65°N for every month of the year. Each term in the heat balance equation was examined, beginning with

the heat transport into the Arctic by ocean currents and the heat gain due to freezing and export of sea ice. The solar radiation term was studied by calculating the loss of short wave radiation in the atmosphere and its reflection at the surface. Terrestrial radiation was examined. Reliable observations are available only for short wave radiation, and the long wave components were obtained by applying radiation laws to the measured state of the atmosphere. The long wave radiation balance and the short wave absorbed radiation values give the total radiation balance at the surface throughout the year. Radiation terms for the top of the troposphere allow the determination of the energy gain and loss for the atmosphere-earth system as a whole. A comparison of the balance at the surface and at 300 mb permits an assessment of the magnitude of non-radiative processes. The radiation balance of the troposphere was obtained as well as the balance for the earth-atmosphere system. Characteristic radiation balance areas were presented in maps and cross sections. -- BLE

SIP 22413

551, 324, 4/. 8(\*49)

Taylor, L. D.  
ICE STRUCTURES, BURROUGHS GLACIER, SOUTH-EAST ALASKA. Rept. No. 3, RF Proj. 1122, Ohio State Univ. Res. Foundation, 109p. incl. illus., tables, graphs, diagrs., maps, July 1962. 135 refs.  
DLC, Tech. Rept. Collection

Investigations were made on the Burroughs Glacier, southeast Alaska, during the summers of 1959 and 1960 to determine the characteristics and origin of structures and related fabric in ice that was once 300 to 400 m beneath glaciers of the Little Ice Age. The glacier (14 x 3 km) is cut off from any ice source and is entirely below the firn line. Between 1948 and 1960 the ice surface dropped at the rate of 0.8 m/yr at 500 m elevation, and 6.8 m/yr at 175 m elevation near the terminus. Three types of ice were identified at the glacier surface: foliated, coarse-grained border, and very coarse-grained basal. Two systems of fine-grained foliation are present: a steeply dipping system of persistent longitudinal orientation and a gently dipping system having a regional trough-like structure. Longitudinal foliation is caused primarily by faster ice flow at the centerline than at the margins, and faster flow at the surface than at the bottom, which produces differential movement and recrystallization along closely spaced layers. The optic orientation was measured in 800 crystals in the foliated ice of the eastern tongue 600 m from the terminus. A triple maxima fabric is present in the coarse ice and a single maximum is present in the fine ice. The triple maxima fabric may have formed by shear near the glacier bottom or along gently dipping foliation planes which are farther from the terminus. Structural evidence suggests that ice flow during the early stage of the Little Ice Age was from west to east through the Burroughs Valley and during waning stages of ice advance. (Author's abstract, modified)

SIP 22414

551.324.3:528.9(79)

Davey, Ann  
CHANGES IN BLUE GLACIER, MOUNT OLYMPUS,  
WASHINGTON. Rept. No. 1, RF Proj. 1278, Ohio  
State Univ. Res. Foundation, 12p. incl. table,  
diagr., maps, Feb. 1962. 16 refs.  
DLC, Tech. Rept. Collection

Two maps were prepared on a scale of 1:5000 showing the changes in the surface height of the Blue Glacier between specified dates, from which the volume change of the glacier was calculated. The cartographic method involves overlaying two topographic maps and obtaining the height change for a number of closely spaced points over the whole glacier, and from these obtaining the mean height change to multiply by the area used to give the volume change. The results obtained by formulas agree well with those obtained by the cartographic method. For the period 1952 to 1957 the mean height of the glacier increased by about 10 m. The figures for the 1939-52 comparison are far more variable than those for 1953-57 and show that, while the snout and valley portion of the glacier were diminishing, the upper part was increasing. The largest decrease for 1939-52 is in the snout section where the south snout has retreated over 200 m and lost a maximum of 45 m in thickness at the tip. Between 1952 and 1957 the 50-m snout advance was accompanied by an increase in thickness of 10 m. Near the edge of the glacier there are many areas of large increase and decrease in ice surface heights. No distinction was made on the maps between ice and snow. Below the Ice Falls the position of the snow line is reflected in the 1939-52 map by the change from decrease to increase in the ice-surface height. Above the Ice Falls, in the accumulation basins, increase and decrease areas, which appear on both maps, are a reflection of change in the accumulation pattern by wind effects.  
-- BLE

SIP 22415

91:551.324:551.582(\*384)

Loewe, Fritz  
A VISIT TO THE SUKKERTOPPEN HIGHLAND ICE  
AND THE REGION TO THE EAST. p. 3-5. (In:  
Reconnaissance [sic] of Sukkertoppen Ice Cap and Ad-  
jacent Tasersiaq Area, Southwest Greenland. Rept.  
No. 4, RF Proj. 1490, Ohio State Univ. Res.  
Foundation, Oct. 1962).  
DLC, Tech. Rept. Collection

This paper discusses the history of the area, its accessibility, and the history of the excursion. Remarks are given concerning the weather conditions in Aug. 1962. Access on foot is easiest over the edge of the highland ice from the mouth of the Sarfartok River. To reach the eastern part of the region a fold-boat carried to the western end of Tasersiaq is most suitable. Helicopter landings are possible almost everywhere. Float-planes can

touch down on Tasersiaq and some other lakes in the region. It might be possible to land and start a light plane on some of the terraces bordering Tasersiaq. The region between Søndre Strömford and the Sukkertoppen Highland Ice is dry and relatively warm in the summer. The range of the 6-hourly observations was between +19° and +2° C. The winds are greatly influenced by local conditions. On the highland ice, the wind is usually a density flow along the ice slopes. A standing wave cloud over the range north of Tasersiaq is frequently present and persists with an otherwise changing cloud picture. The total precipitation at the base camp at Tasersiaq, between Aug. 1 and 20, amounted to 20 mm. After Aug. 10, the precipitation fell on the highland ice above 1000 m mainly as snow. An interesting case of lateral refraction was observed which was probably caused by alternating columns of warm air rising from, and cold air descending into, the intervening trench of the Tasersiaq valley. -- BLE

SIP 22416

551.324(\*384)

McCormick, Jack  
AIR TEMPERATURE OBSERVATIONS: TASERSIAQ,  
AUGUST, 1962. p. 6-8 incl. tables. (In: Recon-  
naissance [sic] of Sukkertoppen Ice Cap and Adjacent  
Tasersiaq Area, Southwest Greenland. Rept. No. 4,  
RF Proj. 1490, Ohio State Univ. Res. Foundation,  
Oct. 1962).  
DLC, Tech. Rept. Collection

Air temperature data are given from measurements made during various types of overcast from 5 to 50 ft above lake level. The date and time of each measurement are given for 9 camps which include terrace and moraine locations; a small stream valley; Cach Point, Tasersiaq, at the mouth of Gneiss Gorge; a small cove on the north shore of Tasersiaq; and Rendezvous Camp at the foot of the mountain below Sukkertoppen Ice Sheet, 1 mi south of the lake. A Taylor general testing thermometer was used which was exposed in the shade of a tent about 3 ft above the ground. Three lake-water measurements were made. The air temperatures range from 37° F at sun down to 66° F on a sunny day with high cirrus clouds. -- BLE

SIP 22417

551.324.3/.8(\*38)

Bull, C.  
GLACIOLOGICAL RECONNAISSANCE OF THE  
SUKKERTOPPEN ICE CAP. p. 9-12 incl. graph,  
map. (In: Reconnaissance [sic] of Sukkertoppen Ice  
Cap and Adjacent Tasersiaq Area, Southwest Green-  
land. Rept. No. 4, RF Proj. 1490, Ohio State  
Univ. Res. Foundation, Oct. 1962).  
DLC, Tech. Rept. Collection

See SIP 21446

GLACIOLOGICAL RECONNAISSANCE OF THE  
SUKKERTOPPEN ICE CAP, SOUTH-WEST  
GREENLAND. J. Glaciol. 4(36):813-816, incl.  
graph, map, Oct. 1963. 13 refs.  
DLC, GB2401.368

SIP 22418

551.33(\*394)

Treves, Samuel B.  
PRELIMINARY REPORT ON THE GEOLOGY OF  
THE TASERSIAQ AREA. p. 31-35 incl. table. (In:  
Reconnaissance[sic] of Sukkertoppen Ice Cap and  
Adjacent Tasersiaq Area, Southwest Greenland.  
Rept. No. 4, RF Proj. 1490, Ohio State Univ. Res.  
Foundation, Oct. 1962).  
DLC, Tech. Rept. Collection

Investigations were made from July 31 to Aug. 20,  
1962. Emphasis is laid on bedrock geology, inclu-  
sions, gneisses, granitic rocks, basic dikes,  
geologic history, and glacial geology. Striations,  
erratics, balanced rocks, and glacial shaping and  
polishing of the rocks which, constitute even the  
highest peaks, indicate that this area was once com-  
pletely covered with ice. The ice has recently ad-  
vanced over portions of this area. At the east end  
of the peninsula the ice advanced 2 mi up the valley.  
At the head of the south arm of the lake, outwash  
streams from the main ice cap discharge into the  
lake. Outlet glaciers and glaciated valleys inter-  
rupt the shore line of the southern shore of the south  
arm of the lake. As many as 6 moraines can be  
identified in some of the valleys, and moraines  
built out into the lake mark the ends of some of the  
glaciers. -- BLE

SIP 22419

612.592:613.11(\*743)

Budd, G. M.  
PHYSIOLOGY, MEDICINE. GENERAL ACCLI-  
MATIZATION TO COLD IN MEN STUDIED BEFORE,  
DURING AND AFTER A YEAR IN ANTARCTICA.  
Austral. Natl. Antarctic Res. Expeds., ANARE  
Repts., Ser. B, vol. 4, Publ. No. 70, 84p., incl.  
illus., tables, graphs, maps, appendix, May 1964.  
114 refs.  
DLC, G845.A8

Four Caucasian men were exposed naked to an air  
temperature of 10° C for 95 min, twice on each of  
five occasions during a 73-week period in Melbourne,  
Australia, and Mawson Station between 1958 and  
1960. Throughout this period they sustained con-  
siderable cold exposure outdoors, often while in-  
adequately dressed. A highly significant improve-  
ment which occurred in their ability to maintain  
rectal temperature during acute cold stress is  
attributed to general acclimatization to cold. Heat  
production and skin temperature did not change sig-  
nificantly although extremity temperatures were  
generally lower in Antarctica. Tissue insulation  
appears to have increased owing to changes in the  
vasomotor response to cold, which may have been  
mediated by changes in catecholamine metabolism.  
The degree of acclimatization was inversely related  
to air temperature but not to the hours of daylight.  
Its development was apparently slow but its decay  
was rapid. The small degree of acclimatization  
remaining six weeks after the cessation of cold ex-  
posure rendered the subjects less able to maintain  
rectal temperature than they had before acclimatiza-  
tion was first achieved. (Author's abstract, mod-  
ified)

SIP 22420

612.015.3:612.592(\*2)

Wilson, Ove  
BASAL METABOLIC RATE OF "TROPICAL" MAN  
IN A POLAR CLIMATE. (In: Biometeorology, Pro-  
ceedings of the Second International Bioclimatologi-  
cal Congress, London, 1960. Edited by S. W.  
Tromp. New York, Macmillan Co., 1962, p. 411-  
426 incl. tables). 54 refs.  
DLC, QH543.148

Naked man in his mode of heat regulation can be re-  
garded as a tropical or subtropical creature with a  
narrow zone of adaptability; the difference in the  
BMR determined in the tropics and in a temperate  
zone for the same individuals does not exceed 10%.  
In the climatic extremes, man raises his calorific  
output in situations of stress but does not adapt by  
further changing his BMR. Some native people, how-  
ever, appear to have the ability to endure a moderate  
cold stress without increasing their heat production  
above normal basal values. Metabolic determina-  
tions made on the Norwegian-British-Swedish Expe-  
ditions during two years (1950-51) of continuous ex-  
posure to the Antarctic climate show the same  
mean level of the BMR of white man regardless of  
climate. Evidence of acclimatization of man to cold  
will not be found in the basal metabolic rate. The  
polar climate in its extreme form can impose cer-  
tain seasonal variations in the BMR. This periodi-  
city is probably not a direct effect of climate on  
metabolism, but is related to it by reason of the  
typical activity pattern which ensues in the Antarctic  
climate. These variations depend upon changes in  
the type of activity, food, exposure, muscle tone and  
other factors, which are imposed by a difference in  
climate and regimen. (Author's abstract, modified)

SIP 22421

551.4+551.33(\*762)

Calkin, Parker E.  
GEOMORPHOLOGY AND GLACIAL GEOLOGY OF  
THE VICTORIA VALLEY SYSTEM, SOUTHERN  
VICTORIA LAND, ANTARCTICA. Ohio State Univ.  
Inst. Polar Studies Rept. No. 10, 66p., incl.  
illus., tables, graphs, diagrs., maps, March 1964.  
52 refs.

DLC, Tech. Rept. Collection

In southern Victoria Land the inland ice plateau is bounded by a mountain range. Outlet glaciers from the plateau have carved valleys through the range. Most of these valleys are still ice-filled, but an amelioration of climate has caused the glaciers to retreat from some, including the five valleys which constitute the Victoria Valley system. The walls of the Victoria Valley system rise steeply to 2000 m in elevation but are broken by cirques, many of them ice-free. Small valley glaciers enter the area from ice fields in the east, north, and west. Glacial solifluction deposits mantle the valley floors. The area is a cold desert. Drainage is largely internal; the meager stream flow is confined to the summer months when saline ponds and larger perennially frozen lakes of the valleys are replenished by melt-water. Constant strong winds produce sand dunes, sand mantles, pebble ridges, and well-formed ventifacts. Two major glaciations are recorded in the Victoria Valley system, but they may have been preceded by others. The first distinguishable glaciation, the Insel, was an eastward flow of ice from the inland plateau through the valleys to the coast. The second, or Victoria Glaciation, is subdivided into the Bull, Vida, and Packard episodes. The Victoria Glaciation, which began more than 30,000 yr B.P., was marked by strong invasions from local ice fields and from the coast, and weaker invasions from the inland ice plateau. (Author's abstract, modified)

SIP 22422

612.592:613.11(\*7)

Budd, G. M.  
ACCLIMATIZATION TO COLD IN ANTARCTICA AS  
SHOWN BY RECTAL TEMPERATURE RESPONSE TO  
A STANDARD COLD STRESS. *Nature*, 193(4818):  
886, March 3, 1962. 7 refs.  
DLC, Q1.N2

Four members of the 1958-60 Australian National Antarctic Research Expedition were exposed to 50° F for 95 min while lying naked on a nylon-mesh mattress for a total of 40 exposures before, during, and after a year in the Antarctic. Five series of tests were carried out, and in each series the same four subjects were exposed twice. Series 1 was done in Melbourne in Dec. (summer) 1958, immediately before sailing to the Antarctic. Series 2, 3, and 4 were conducted at Mawson in 1959, in autumn, spring, and summer respectively, and series 5 was carried out a

week after returning to Melbourne in March (autumn) 1960, one month after the expedition ship had left Antarctic waters. In series 1 the cold exposure caused a fall in rectal temperature (-0.15° C at the end of the exposure). In the Antarctic, the rectal temperature rose (+0.25° C at the end of the exposure). In series 5, in Melbourne, a slight early rise occurred but was not sustained, and thereafter the rectal temperature fell steeply to a lower level (-0.42° C) than in series 1. Analysis of the variance of the rectal temperature changes after 90 min in the cold showed that the differences between the series were highly significant ( $P < 0.001$ ). -- BLE

SIP 22423

624.131.436:551.511.33:536.2

Scott, R. F.  
HEAT EXCHANGE AT THE GROUND SURFACE.  
Cold Regions Science and Engineering, Part II, Section A1, U. S. Army Cold Regions Research and Engineering Laboratory, 49p. incl. illus., tables, graphs, diagrs., maps, appendix, July 1964. 56 refs.

CRREL files

This report summarizes current knowledge about the heat exchange at the ground surface from an engineering viewpoint, aiming at the solution of the problem of predicting the ground penetration of the freezing point isotherm from weather, soil, and surface conditions. The fundamental requirement of all subsurface temperature and thaw or freeze predictions is a knowledge of the thermal properties of the local soil. These are: thermal conductivity, specific heat, and latent heat. Four methods are discussed of obtaining thermal properties, and methods of determining the heat budget at the ground surface are described. In order to understand the heat exchange processes at the earth's surface and to obtain quantitative evaluation of heating loads on buildings and the effects of other meteorological phenomena on the design and operation of structures in cold regions, it is necessary to have a knowledge of the processes of solar and atmospheric short- and long-wave radiation, the distribution of wind and temperature in the air, and the temperature and properties of the soil below the surface. These components of heat balance are discussed in detail. -- BLE

SIP 22424

624.142(\*2)

Gardner, J. P., P. D. Gilson, and A. C. Paradis  
WINTERIZING ART GAINS BUT NEW PROBLEMS  
DEVELOP FOR ARCTIC MACHINERY OPERATORS.  
*SAE J.*, 72(5):57-59 incl. illus., diagrs., May 1964.  
DLC, TT 85

The basic objectives of winterization which have yet to be fully attained are as follows: (1) reasonable protection, comfort, and visibility for the operator,

assuming that he will remain heavily clothed; (2) prompt warmup and reliable starting of equipment; (3) emergency starting help or service from any type of slave kit, vehicle, or equipment; and (4) additions or modifications to the machine to enable it to maintain internal operating temperatures high enough for satisfactory performance while retaining reasonably normal reliability and durability, with minimum increases in maintenance over that required in a temperate climate. Problems in cab design, engine winterization, and chassis winterization are discussed and related to recent advances in construction equipment design which is often incompatible with cold climate operation. Typical examples are cited for engine turbochargers and hydraulic power equipment in connection with preheating, freezing of fluid media, clogging of pipes, unreliability of electronic components and other similar maintenance and operational difficulties. -- FMV

SIP 22425 551,326,85:536:551,524(\*762)

Ragotzkie, Robert A. and Gene E. Likens  
THE HEAT BALANCE OF TWO ANTARCTIC LAKES.  
Limnol. Oceanogr. 9(3):412-425 incl. tables,  
graphs, diagrs., maps, July 1964. 13 refs.  
DLC, GC1.L5

The thermal structures of Lakes Vanda and Bonney in Victoria Land are examined and the heat balance of Lake Vanda evaluated. Both lakes are permanently ice-covered and have high salt concentrations that increase with depth. The deep water of Lake Vanda is very warm (25°C), while that of Lake Bonney is cold (-2.8°C). Lake Vanda gains heat from solar radiation and by conduction from the bottom. All the heat gained is accounted for by melting of the undersurface of the ice and evaporation from the upper surface. Changes in sensible heat storage in the water in both lakes are extremely small. Lake Vanda has four layers of constant density water that are maintained by convective circulation driven by heating from below. The existence of a strong circulation in the thickest of these layers is demonstrated by a radioactive tracer experiment that revealed a horizontal current of 1 cm/sec at 20 m and some vertical mixing. No evidence of convective activity was found in Lake Bonney. Hypotheses put forth by other workers to explain the warm water of Lake Vanda by solar heating alone and by subsurface advection from thermal springs are considered and rejected. (Authors' abstract, modified)

SIP 22426 061,6,001,5(\*2)

Stehle, N. S.  
U. S. NAVAL CIVIL ENGINEERING LABORATORY.  
POLAR ENGINEERING AND RESEARCH. Spec.  
Libr. Assoc. Geogr. and Map Div. Bull. No. 53-6-9, Sept. 1963.  
DLC, Map Div.

The Naval Civil Engineering Laboratory is the research and evaluation organ for the Bureau of Yards and Docks and engages in a broad and diversified program which includes applied science and engineering. The Polar Division is staffed with 10 engineers and scientists and 2 technicians who research, develop, evaluate, and test process materials, equipment, and structures for use in the design, construction, operation, and maintenance of the naval shore establishments in the polar regions. Developments to provide improved living facilities in polar regions have been directed toward improving camp structures, air conditioning, water supply, sanitation, and other camp facilities as well as developing packaged camps for these regions. A cold-processing snow-compaction technique which produces high-strength snow for use as airfields, vehicle roads, and parking areas has been developed. In an attempt to increase the strength and bearing capacity of sea ice, field investigations have been conducted of the accelerated thickening of ice at the surface. Free flooding proved to be the easiest method; electrical submersible pumps have been developed which can be frozen into place at the beginning of construction. The Polar Division has also compiled and published technical data on the engineering, construction, and operational problems of the Deep Freeze operations in Antarctica. The Technical Library Division services the entire Laboratory. -- BLE

SIP 22 026,001,5(\*2)

Kennedy, Ted C.  
ARCTIC AEROMEDICAL LIBRARY, U. S. AIR FORCE. Spec. Libr. Assoc. Geogr. and Map Div. Bull. No. 53:9-12, Sept. 1963.  
DLC, Map Div.

The mission of the Arctic Aeromedical Laboratory (organized in 1947 at Randolph AFB, Texas) is (1) to conduct an in-house program of research on arctic human factors problems, (2) to establish Air Force requirements for clothing, personal equipment, operating procedures, and training programs for use in the Arctic, (3) to evaluate, under arctic conditions, items of clothing and equipment developed in other Air Force laboratories, and (4) to provide laboratory facilities, logistic support, and technical assistance to visiting research teams or field parties. Personnel and contractors, facilities, activities of the departments, publications, related organizations, and the Technical library are also discussed. -- BLE

SIP 22428 551,324,28:551,324,5(\*765)

Swithinbank, Charles  
TO THE VALLEY GLACIERS THAT FEED THE  
ROSS ICE SHELF. Geogr. J., 130(1):32-48 incl.  
illus., diagrs., maps, March 1964.  
DLC, G7.R91

Measurements were made in 1960-62 to determine the rates of movement of 7 valley glaciers flowing into the Ross Ice Shelf. Intended seismic work to determine thicknesses was not complete, although 140 gravity stations were occupied and 150 mi of the Queen Maud Range was surveyed and triangulated. Of the 7 glaciers visited (Byrd, Beardmore, Mulock, Nimrod, Robert Scott, Amundsen, and Liv), Byrd is the fastest (7 ft/day), and Liv is the slowest (1 ft/day). The average movement rate of 1100 ft/yr must add about 15 mi<sup>2</sup>/yr to the ice shelf; and, with a possible average thickness of 2000 ft, the total discharge is 6 mi<sup>3</sup>. Accounts are also given of trail conditions and logistics of field work. -- JFS

SIP 22429

551.34(+784.2)

Nougier, J.  
PERIGLACIAL OBSERVATIONS IN THE KERGUELEN ARCHIPELAGO, FRENCH SOUTHERN AND ANTARCTIC LANDS. (Observations périglaciaires dans l'Archipel de Kerguelen, Terres Australes et Antarctiques Françaises; Text in French with German summary). Zeit. Geomorphol. 3(Sonderheft), 143-149 incl. illus., map, Jan. 1964. 6 refs.  
DLC, G1.247

Frost heaving and rock shattering are more pronounced on the northwest (windward) side of moraines facing the Cook icefield than on the leeward side. Katabatic winds from the icefield drive moisture into rocks and fissures on the windward side, which is subject to repeated freeze-and-thaw. Patterned ground of reticulated form is described and related to convergence of soil stripes found on gently-sloping ground where morainic debris rests upon impermeable basalt. -- Geomorph. Abstracts

SIP 22430

551.524:551.513(+50)

Mildner, P.  
AN ATTEMPT TO FORECAST WINTER TEMPERATURE ANOMALIES IN THE SOUTHEASTERN PART OF RUSSIA. (Über einen Versuch der Vorhersage winterlicher Temperaturanomalien für das südöstliche Russland; Text in German). Fachliche Mitteilungen, Abteilung Wetterberatung der Bundeswehr im Allgemeinen Luftwaffenamt, Ser. 1, No. 32, 10p. incl. maps, May 1961. 1 ref.  
DLC, Unbound periodical

Data from Station Astrakhan, which are considered representative of the winter temperature anomalies in the southeastern part of Russia, are related to the form and intensity of the general circulation over the Northern Hemisphere. The temperature conditions at Astrakhan are determined by the behavior of the circulation over the North American continent. It is concluded that the character of the circulation does not change irregularly and that these changes, as well as the winter temperature anomalies, are predictable with a good degree of accuracy. -- BLE

SIP 22431

634.1/.8:632.111/.112(43)

Scultetus, H. P.  
RESULTS OF EXPERIMENTS TO PREVENT FROST DAMAGE TO FRUIT TREES IN THE LOWER ELBE REGION. (Ergebnisse der Frostbekämpfungsversuche im Obstbaugbiet der Niederelbe im Frühjahr 1960; Text in German). Fachliche Mitteilungen, Abteilung Wetterberatung der Bundeswehr im Allgemeinen Luftwaffenamt, Ser. 1, No. 35, 13p. incl. diagrs., May 1961. 1 ref.  
DLC, Unbound periodical

Frost prevention experiments were conducted in the fruit-tree region of the Lower Elbe Region by artificial heating. Drily temperature measurements showed that the nocturnal air temperature minima within the orchard were lower at a height of 150 cm than those temperature minima in the adjacent grass land. This is probably due to the complicated radiation process in the orchard. The effectiveness of the heating depends on the general weather conditions. Frost damage is prevented only when a good surface inversion develops. Otherwise, the heated air goes straight up. -- BLE

SIP 22432

551.578.72:551.577.61(+50)

Pastuch, W. P. and R. F. Sochrina  
HAIL IN THE REGION OF THE SOVIET UNION. (Grad na territorii SSSR; Text in Russian). Trudy Glavnoi Geofizicheskoi Observatorii, Vyp. 74:3-31 incl. tables, graphs, 1957. 4 refs. Also: Fachliche Mitteilungen, Abteilung Wetterberatung der Bundeswehr im Allgemeinen Luftwaffenamt, Ser. 1, No. 28, 40p., April 1961.  
DLC, QCR01.L46

The peculiarities and geographical distribution of hailstorms in the USSR are investigated on the basis of data from more than 3300 meteorological stations. Emphasis is placed on (1) hail damage to crops, (2) the influence of elevation, mountains, and bodies of water on hailfall, (3) the daily occurrence (time of day) and duration of hailfall, (4) the relationship between hailfall and storms, (5) the yearly occurrence (time of year) of hailfall, (6) the greatest number of days with hailfall during the period 1891-1950, and (7) the probability of occurrence of hailfall during individual years. The higher occurrence of hailfall in high-elevation areas is explained by the increase of turbulence in the vicinity of the ground surface, and by the increase in convection clouds. In areas of large bodies of water, hailstorms occur less frequently. In the central areas of the USSR, most hailfall occurs in the afternoons toward the end of spring and the beginning of summer. Fifty percent of the hailfalls do not exceed 5 min in duration, 30% last 5 to 20 min, and 20% last 20 min or more. The hailfall is usually accompanied by storms combined with cold air masses. The path of the cold front can often be determined by bands of fallen hail. Extensive data are tabulated and graphed. -- BLE

# CRREL BIBLIOGRAPHY

SIP 22433

551.345(+50)

Orlowa, W. W.  
SEASONAL PERMAFROST IN THE SOVIET UNION.  
(Ustofchivye morozy v SSSR; Text in Russian). Trudy  
Glavnoy Geofizicheskoy Observatorii, Vyp. 85:32-49  
incl. maps, 1958, 3 refs. Also: Fachliche Mitteil-  
ungen, Abteilung Wetterberatung der Bundeswehr im  
Allgemeinen Luftwaffenamt, Ser. 1, No. 10, 27p.,  
1960.

DLC, QC801.L46

This report presents data concerning the dates of  
appearance and disappearance of permafrost in rela-  
tion to geographical distribution and climatological  
factors in the Soviet Union. The greatest difference  
between the maximum and minimum number of days  
of permafrost occurs in the west and southwest of  
Russia (100 days), and the smallest difference occurs  
in the east (30 days). Attempts to correlate perma-  
frost duration with the temperature of individual years  
have yielded no positive results. Also, the years  
with the longest duration of permafrost do not corre-  
spond to the years with the most amounts of negative  
temperatures. -- BLE

SIP 22434

551.578.42(4)

Glebowa, M. Ja.  
THE SNOW COVER IN WESTERN EUROPE. (Snezhnyy  
pokrov v Zapadnoy Evrope; Text in Russian). Trudy  
Glavnoy Geofizicheskoy Observatorii, Vyp. 85:50-72  
incl. tables, graphs, maps, 1958, 34 refs. Also:  
Fachliche Mitteilungen, Abteilung Wetterberatung der  
Bundeswehr im Allgemeinen Luftwaffenamt, Ser. 1,  
No. 21, 35p., 1960.

DLC, QC801.L46

The snow cover in western Europe is described  
according to the number of days that an area is  
covered with snow during the winter. Extensive data  
are given which correlate snow cover distribution and  
duration with climate, geographical location, and  
height above sea level. Western Europe is divided  
into 5 zones according to snow-cover duration. --  
BLE

SIP 22435

551.574.7:621.315.1:551.4(+50)

Rudneva, A. V.  
ON THE QUESTION OF THE DEPENDENCE OF  
POWER-LINE ICING ON TERRAIN TYPE. (K  
voprosu o zavisimosti velichiny otlozheniya l'da na  
provodakh ot rel'efa; Text in Russian). Trudy  
Glavnoy Geofizicheskoy Observatorii, Vyp. 88:25-29  
incl. tables, graphs, 1960, 1 ref. Also: Fachliche  
Mitteilungen, Abteilung Wetterberatung der Bundes-  
wehr im Allgemeinen Luftwaffenamt, Ser. 1, No. 27,  
9p., 1961.

DLC, QC801.L46

The analysis of observational data concerning the  
frequency and intensity of ice and rime in the USSR  
shows a dependence of meteorological elements on  
terrain features. Eight types of ground formations  
are described. Graphs are presented which show the  
relationship between the number of days with glaze  
and ground type. Ice deposits on power lines are  
greater in areas where glaze and rime occur fre-  
quently. With respect to the extent of icing, Russia,  
with the exception of the mountain regions, can be  
divided into 3 climatic areas: the northern half, and  
the southwest and southeast areas. -- BLE

SIP 22436

551.46.06(+735)

Kuga, Yushiro and Kunihiko Watanuki  
ON THE OCEANOGRAPHICAL OBSERVATION OF  
THE 6TH JAPANESE ANTARCTIC RESEARCH EX-  
PEDITION (1961-1962). (Dai 6 ji nankyoku kansoku  
ni okeru kairyo no shomondai; Text in English with  
Japanese summary). Antarctic Rec. (Tokyo), No.  
18:27-44 incl. tables, graphs, map, March 1963.  
DLC, Orientalia Div.

Oceanographic data are presented for the route be-  
tween Cape Town and Lutzow-Holm Bay. Daily  
sampling of sea water resulted in studies on tem-  
perature, pH, dissolved oxygen, phosphate, silicate,  
nitrate, nitrite, chlorinity, and trace elements.  
Bathythermograph and other data are tabulated and  
graphed. -- JFS

SIP 22437

550.4(+736)

Watanuki, Kunihiko  
GEOCHEMICAL RESEARCHES IN THE 6TH JAPA-  
NESE ANTARCTIC RESEARCH EXPEDITION (1961-  
1962). (Dai 6 ji nankyoku chiiki kansokutai chikyū  
kagaku bumon hokoku; Text in Japanese with English  
summary). Antarctic Rec. (Tokyo), No. 18:45-49  
incl. tables, map, March 1963.  
DLC, Orientalia Div.

Geochemical studies on board the Soya and in the  
Ongul Islands area included daily sampling of sea  
water for chemical analysis and rain, snow and sea  
ice radioactivity. No radioactivity of snow was de-  
tected in the Antarctic region. Pool water from the  
Ongul Islands was tested for temperature, pH and  
electrical resistance. The maximum water tempera-  
ture was +15.2°C. Other studies included wind-borne  
salt collected with wet gauze and salt samples found  
on rocks. Some rocks were collected. Radioactivity  
and pool water data are tabulated. -- JFS



# CRRRL BIBLIOGRAPHY

SIP 22438

69(211:50)

Velli, I. A., V. V. Dokuchaev and N. F. Fedorov  
BUILDINGS AND CONSTRUCTION IN THE FAR  
NORTH. (Zdanisâ i soorusheniâ na kraĭnem severe;  
Text in Russian). 491p. incl. illus., tables, graphs,  
diags., map. Leningrad, Gos. izd-vo Lit-ry po  
Stroitel'stvu, Arkhitekture v Stroit. Materialam,  
1963.

DLC, TH86. A1V4

Information is provided for planning and constructing  
cities, civil works and industrial buildings and their  
structural elements in the Far North of the USSR.  
Problems arising when laying foundations on perma-  
frost and thawing grounds are discussed and methods  
for their solution are suggested. Municipal problems  
regarding water supply, sanitation, sewage disposal,  
power transmission lines in very cold regions are re-  
viewed. A series of examples of water and sanitary  
installations built in the extreme north of the country  
is given and their cost indicated in order to facilitate  
the task of the engineers and technicians in the  
future. -- VDP

SIP 22439

551.336:551.79:577.46(\*548)

Hoppe, Gunnar  
SOME COMMENTS ON THE "ICE-FREE REFUGIA"  
OF NORTHWESTERN SCANDINAVIA. p. 321-335  
incl. diags., maps. (In: Askel and Doris Löve  
(eds.), North Atlantic Biota and Their History. New  
York, Pergamon, 1963). 54 refs.

DLC, QE84.3.L6

Peculiarities in the distribution of plants and animals  
in northwestern Scandinavia and the occurrence of  
endemic species in that region have induced many  
biologists to postulate the existence of ice-free areas  
during the last (Würm) glaciation. Two main refugia  
have been localized tentatively, one consisting of  
coastal areas in northern Norway, including the  
Lofoten and Vesterålen Islands, the other situated in  
western Norway and composed of the Stad-Sunnmøre  
area and the districts at the mouths of Sognefjord and  
Stavangerfjord. The "unglaciated" areas are said to  
be of 2 kinds: small nunataks rising above the inland  
ice and larger foreland areas situated above as well  
as below the present shoreline. Evidence relevant  
to this theory which was obtained from investigations  
of the Antarctic ice cap is discussed, and the main  
features of the Würm glaciation in northern Europe  
are described. One of the strongest arguments for  
the refugium hypothesis is the existence of plants  
and animals with a so-called bicentric distribution.  
There may, however, be other ways of explaining  
such distributions. It is pointed out that the sup-  
posed refugium areas probably were deglaciated  
earlier than the rest of northern and western Scandi-  
navia, and thus both flora and fauna have had a longer  
time to become established. -- BLE

SIP 22440

551.336:551.79(\*41)

Ives, J. D.  
FIELD PROBLEMS IN DETERMINING THE MAXI-  
MUM EXTENT OF PLEISTOCENE GLACIATION  
ALONG THE EASTERN CANADIAN SEABOARD -  
A GEOGRAPHER'S POINT OF VIEW. p. 337-354  
incl. illus., maps. (In: Askel and Doris Löve  
(eds.), North Atlantic Biota and Their History. New  
York, Pergamon, 1963). 25 refs.

DLC, QE84.3.L6

The physical conditions of the eastern Canadian sea-  
board are reviewed, and evidence concerning the ex-  
tent of Pleistocene glaciation in this area is dis-  
cussed. The evidence indicates that most of the  
highest summits in northern Labrador, if not all of  
them, have been inundated at some time prior to the  
Last Glaciation, although no evidence is available for  
Baffin Island. Either the detrital trim line, or the  
Saglek moraines, may be taken to mark the upper  
limit of the Last Glaciation in Labrador. Conditions  
may have been similar in Baffin Island and along the  
entire eastern Canadian seaboard. It is concluded  
that large areas in northern Labrador and Baffin  
Island remained ice-free at the maximum of the Last  
Glaciation. This implies that appreciable areas of  
the continental shelf may have been dry land and thus  
have provided ample habitats for the survival of a  
wide range of flora and fauna. The mountain-top  
detritus required a considerable period of time for  
mature development. Wide areas of the High Arctic  
may have been covered by cold, thin, stagnant ice,  
of which no trace remains today. Suggestions are  
given for future investigation. -- BLE

SIP 22441

551.466.3:551.326(\*60:765)

LeSchack, Leonard A. and Richard A. Haurich  
OBSERVATIONS OF WAVES ON AN ICE-COVERED  
OCEAN. J. Geophys. Res. 69(18):3815-3821 incl.  
table, graphs, diags., map, Sept. 15, 1964. 8 refs.

DLC, QC811.J6

A gravity meter read on floating ice, such as pack  
ice, shelf ice, or ice islands, shows a typical oscilla-  
tion of about 20- to 60-sec period corresponding to  
motions of the order of a few hundred microns. This  
phenomenon has been reported in the literature by  
Crary, Hunkins, and others. The motion of an ice-  
covered ocean is related to long-period gravity waves  
on the open ocean. The motion of the ice is no doubt  
due to the combined effect of waves entering the ice  
field from the open ocean and local winds. Power  
spectrums over the band 10- to 100-sec period were  
computed for several records made at stations on  
pack ice (1-3 m thick) [near Arlis II], ice islands (20-  
50 m thick) [T-3 and Arlis II], and shelf ice (250 m  
thick) [Ross Ice Shelf at Little America Station]. The  
spectrums have the same general form for the three  
different ice covers, and they show a sharp increase  
in spectral density with period in the band 10 to 100  
sec. Records made during a storm and during a quiet

# CRREL BIBLIOGRAPHY

period show an increase in wave motion due to local winds, especially at longer periods. (Authors' abstract, modified)

SIP 22442

624, 144, 55(52)

Sumida, Toyotarō  
PERFORMANCE TEST OF MITSUBISHI ROTARY SNOW PLOW MODEL RU20 AT MT. AZUMA. (Bantai azuma sukai rain ni okeru RU20 gata rōtari josetsu shiken; Text in Japanese). Mitsubishi nippon jukō gihō (Technical Review Mitsubishi Nippon Heavy Industries), 4(2):346-348 incl. illus., tables, diagrs., map, Dec. 1963.  
DLC, Orientalia Div.

A performance test was made of the RU20 Rotary Snowplow on the Mt. Azuma skyline in April 1963 when the snow was 0.4-3.0 m high. Three bulldozers were used to clear the way for the rotary plow and a foreign snowplow which followed it. Snow was cleared from 2 lanes on a road 13.4 km long in 9 days. The average fuel consumption was 66 l/km. Depth, width, density, hardness, volume, and weight of the removed snow are tabulated. -- CST/BLE

SIP 22443

551, 343:551, 311, 7:662, 613(52)

Koyama, M., T. Takahashi and Y. Kawai  
ON THE FROST HEAVE CONTROL BY VOLCANIC ASH. (Kazanhai no tōjōsei ni tsuite; Text in Japanese). Hokkaido Kaihatsukyoku Doboku Shikenjo Geppō [Hokkaido, Bureau of Resources, Monthly Rept. Civil Eng. Testing Lab.], No. 131:12-17 incl. table, graphs, diagrs., April 1964. 2 refs.  
DLC, Orientalia Div.

The effectiveness of 48 kinds of volcanic ashes sampled from various places in Hokkaido as a replacement material for frost heave prevention was investigated. Tests were made in a cylindrical mold 3 cm high and 8 cm in diameter. Air temperature was -4°C and ground water temperature was 3°C. In order to study the relationship between frost heave and other soil properties, particle size analysis, X-ray diffraction, plasticity, compaction, and ignition tests were made. The percentage of particles less than 5μ in the ash was found to be proportional to the amount of frost heave. The relation between ignition loss and frost heave was proportional up to an ignition temperature of 400°C. No single test was applicable for all samples. This is attributed to the diversity of the composition of the different ashes. -- CST/BLE

SIP 22444

551, 578, 42(\*50)

Dunaeva, A. V.  
DISTRIBUTION OF SNOW COVER ON THE TERRITORY OF THE NORTHWESTERN ADMINISTRATION OF HYDROMETEOROLOGICAL SERVICE. Soviet Hydrology: Selected Papers, No. 5:423-430 incl. tables, graphs, 1963. 4 refs.  
DLC, Unbound periodical

Problems related to the deposition of snow cover are examined and a law is established which governs the distribution of snow over a certain area. The latter is determined by terrain, the underlying surface, and the degree of sheltering. Four types of snow cover distribution were identified which are dependent on the degree of sheltering and are presented in the form of nomograms. It is pointed out that the data obtained by using the triangle course can apply beyond the boundaries of the snow-survey sector if the selected sector is characteristic of the surrounding locality. If the mean depth value coincides with a 50% frequency, or deviates from it by not over ±1 cm, it is sufficient to calculate only the parameters for the mean depth of the snow cover and the root-mean-square error. Therefore it is more advantageous to calculate the distribution parameters after the distribution table has been compiled. The depth distribution on even sectors of a territory, as shown by an analysis of 2000 snow surveys, is governed by the normal law of random values (Gauss law). The nomogram method permits a reduction in the volume of processing of survey observations, and furnishes a reliable and objective basis for zoning snow cover. -- BLE

SIP 22445

551, 578, 42(\*50)

Lipovskaja, V. I. and E. A. Shcherbakova  
DISTRIBUTION OF MAXIMUM TEN-DAY DEPTHS OF SNOW COVER OF VARIOUS PROBABILITIES ON THE EUROPEAN TERRITORY OF THE USSR. Soviet Hydrology: Selected Papers, No. 5:430-437 incl. graphs, maps, 1963.  
DLC, Unbound periodical

Probability computations are made from data on snow-cover depths obtained by observations of permanent snow stakes installed at meteorological plots in sheltered areas. The data from about 220 stations with a long period of observations (more than 30 yr for 70% of the stations) were used for the European territory of the USSR. Only homogeneous series of snow-cover observations were used for the probability charts. A relationship was established between the long-term mean maximum ten-day snow-cover depth for the winter and the ten-day maximum depths of various probabilities obtained by the permanent stakes. The general character of the distribution of maximum ten-day depths of snow cover of various probabilities is similar to the distribution of the long-term mean maximum ten-day ones for the winter. In the southern part an increase of snow-cover depth was observed from south to north, in

# CRRKL BIBLIOGRAPHY

the central and northern parts an increase was observed from west to east. A deep snow cover was observed on Khibinskiy Plateau. The greatest accumulation of snow occurs on concave slopes whereas it is deposited very unevenly in the tundra zone. -- BLE

SIP 22446

637. 8:551. 328. 032 (\*50)

Eremova, N. D.  
FREEZING OF THE VOTKINSKIY RESERVOIR AND METHODS OF ITS FORECASTING. Soviet Hydrology: Selected Papers, No. 5:450-458 incl. tables, graphs, maps, 1963. 4 refs.  
DLC, Unbound periodical

Ice-formation dates were computed for two regions of the Votkinsk reservoir: those of the town of Okhanak (from 1933 to 1959) and the village of Noshovka (from 1925 to 1960). Ice forms in the reservoir 13-17 days after the appearance of ice in the Kama river. The freezing of the reservoir at Okhanak and Noshovka should occur in the down-stream direction. The mean ice-formation dates should vary from Nov. 15 at Okhanak to Nov. 19 at Noshovka with a discharge of 800 m<sup>3</sup>/sec, and from Nov. 18 at Okhanak to Nov. 22 at Noshovka with a discharge of 2300 m<sup>3</sup>/sec. In finding the forecasting relation for the Okhanak region, estimated ice-formation dates were used for 22 yr. In the Noshovka region, ice-formation dates were used for 23 yr. To prepare a long-range forecast of the dates of the beginning of ice formation on the reservoir it is necessary to (1) determine the direction of the isobars passing through the region in the beginning of Oct.; (2) check the previously prepared forecast; (3) compile an AT500 map after 20 days of Oct.; and (4) determine the values of the geopotential in the first and second regions for 20 days of Oct. -- BLE

SIP 22447

551. 579. 3(235. 21)

Golubev, G. N.  
REGULATION OF MELT WATER BY GLACIERS. Soviet Hydrology: Selected Papers, No. 5:498-501 incl. table, graph, 1963. 3 refs.  
DLC, Unbound periodical

The conditions were studied in the Tien Shan Mountains for the formation of runoff from glaciers. The coefficient of glacial runoff can be assumed a unity and the transformation of the graph of inflow into the hydrograph of streamflow is caused by the slope runoff and basin regulation. Glacier ablation areas are characterized by complex microrelief: ice columns, sink holes, and embryonic grooves. These features all combine into a complex network capable of storing considerable amounts of water. In the absence of melting, the amount of melt runoff depends only on the amount of water stored earlier. A depletion

curve is constructed according to which the discharge of this storage should occur. Field observations showed that the melt water, accumulating on glacial surfaces, is dumped into rivers much faster than the melt accumulated in moraines, near-moraine lakes, and by firm snow of areas which feed glaciers. In principle, it is possible, following steps in reverse, to determine the amount of glacial ablation on the basis of discharge data. This is particularly advantageous in the case of large dendritic-type glaciers for which direct observations of melting are difficult. -- BLE

SIP 22448

551. 579. 5:551. 578. 46 (\*553)

Parshin, V. M.  
ESTIMATING SOIL MOISTURE UNDER A SNOW COVER (FOR A ZONE OF INSUFFICIENT MOISTURE). Soviet Hydrology: Selected Papers, No. 5: 501-508 incl. table, graphs, 1963. 1 ref.  
DLC, Unbound periodical

Soil moisture under a snow cover is estimated indirectly by using data from observation of precipitation, air temperature, and soil moisture of all the stations in Northern Kazakhstan. For this region it is concluded that (1) an estimate should be made for the ground layer 0.5 m deep; (2) for the beginning of the estimate, the end of July should be assumed as the time when the minimum water content is observed in the soil; (3) it may be considered that the precipitation occurring during the period of the estimate is spent on replenishment of the moisture storage in the soil as well as for evaporation, since the surface runoff from rainfalls is practically absent; and (4) the soil moisture before the beginning of the spring snow melt should be assumed to be equal to the soil moisture at the time the snow cover is established. An equation is given of the water balance for the above conditions; and it is pointed out that in the zone of insufficient moisture, evaporation from the water surface is approximately equal to the evaporation from critically wetted soil. Graphs are presented which show the relationship between the storage of effective moisture and total precipitation during a given period. The regularity of the depletion of the storage of effective moisture is also shown. -- BLE

SIP 22449

551. 33' 66(235. 1)

Chuchenzlov, B. S.  
THE CAUSES FOR MOVEMENTS OF THE MEDVEZHNIY GLACIER. Soviet Hydrology: Selected Papers, No. 5:523-524 incl. illus., map, 1963.  
DLC, Unbound periodical

Unexpectedly, toward the end of April 1963, Medvezhiy Glacier, situated between the cliffs of Central Pamir, began to move rapidly. The glacier and its environment are described, and its history is out-

lined. The activity of the glacier and its escape into the Abukagor River valley is determined by the amount of solid precipitation at higher altitudes in the Fedchenko Glacier basin, an excess of height of the firm basin of the Academy of Sciences Glacier above the Medvezhiy Pass, and the comparatively small size of the glacier itself. -- BLE

SIP 22450

551.321.14

Levi, L., S. M. de De Micheli, and L. Lubart  
THERMAL ETCHING ON ICE CRYSTALS. *Physica Status Solidi*, 4(1):63-70, 1964. 10 refs.  
DLC, QC176.A1P6

Thermal etching was studied in pure ice and ice doped with NaCl. A slow evaporation rate on ice crystals was obtained by keeping the samples in nearly hermetic enclosures. The polycrystalline ice was grown in polythene tubes (4 cm in diameter and 30 cm in length) closed at the bottom with a plexiglass base. Doped ice was obtained from NaCl solutions in a concentration range of  $10^{-2}$  to  $10^{-1}$  N. The results showed that etched surfaces on pure ice are covered with pits limited by facets parallel to the basal and prismatic planes, their shape showing the orientation of the crystals. Facets have not been obtained on doped ice surfaces; the shape of etch pits shows no relation to the crystal orientation. For higher temperature differences, the results on doped ice are similar to those obtained on pure ice: warmer samples are smooth, and small crystals are condensed on colder surfaces. -- CLC

SIP 22451

551.324.6(234.3)

Holmes, Herfried  
FLUCTUATIONS OF ALPINE GLACIERS - MEASUREMENTS AND CAUSES. (Schwankungen der Alpengletscher - ihre Messung und ihre Ursachen; Text in German). Umschau, 62(17):558-562 incl. illus., graphs, Sept. 18, 1962. 19 refs.  
DLC, AP30.U5

The development of glaciological investigations in the Alps is reviewed. Systematic observations were begun in 1880 by mountain climbing organizations (Alpenvereine). Only the movement of the glaciers was observed by fundamental methods. Areal changes were measured later by comparing photographs taken at various times. Volume fluctuations can only be determined by modern photogrammetry. Also discussed are methods of measuring the relationship between glacial and climatological fluctuations, hydrological applications in glaciology, and the meteorological analysis of mass balance. Data are graphed concerning mass balance, accumulation, ablation, and the retreat of the Hintereisferner for the period 1953-1961. -- BLE

SIP 22452

551.324.36

Hoffmann, Gert  
THE HIGHEST AND LOWEST TEMPERATURES ON EARTH. (Die höchsten und die tiefsten Temperaturen auf der Erde; Text in German). Umschau, 63(1):16-18 incl. tables, diagrs., Jan. 1, 1963. 2 refs.  
DLC, AP30.U5

The climatic, topographic and geographic conditions favoring the occurrence of extremely high temperatures over the Earth are outlined. Particularly high temperatures occur in the deserts of the Northern Hemisphere. The temperature extremes diminish slowly with increasing geographical latitude in North America and Asia because the equalizing maritime atmospheric flow is no longer effective, and because of the compensating effect of increasing length of day. Owing to the absence of large (ice-free) land masses south of  $50^{\circ}$  S, temperatures above  $30^{\circ}$  C are not encountered. Except for the polar regions the maxima are between  $+50^{\circ}$  and  $+20^{\circ}$  C. The mean annual minima do not drop below  $+10^{\circ}$  C at night in the lowlands of the Amazon River and in the Congo Basin but may be  $80^{\circ}$  lower ( $-80^{\circ}$  C at Verkhoyansk and Oymyakon). Extremely low temperatures,  $-70^{\circ}$  and  $-90^{\circ}$  C, have been reported from Antarctica. Tables are presented giving data on the localities and dates of occurrence and values of absolute temperature extremes, and the fractions of land surface of the Earth involved in the regions of mean annual maxima and minima of temperature extremes, with maps showing the distribution of temperature maxima in  $^{\circ}$  C over the Earth and the distribution of absolute temperature minima in Antarctica. -- Meteorol. & Geostrophys. Abstracts

SIP 22453

550.3:551:551.32(+726.3,+775)

Behrendt, John C.  
ANTARCTIC PENINSULA TRAVERSE GEOPHYSICAL RESULTS RELATING TO GLACIOLOGICAL AND GEOLOGICAL STUDIES. Res. Rept. Ser. No. 64-1, Wisconsin Univ. Geophys. Polar Res. Center. Dept. Geol. 112p. incl. tables, graphs, diagrs., maps, appendixes, March 1964. 42 refs.  
DLC, Tech. Rept. Collection

The Antarctic Peninsula is an island separated from the Sentinel Range by a channel 1000 m below sea level and from the Eights Coast by a channel 500 m deep. Numerous high-amplitude magnetic anomalies with sources close to ice bottom characterize the southern Antarctic Peninsula. The few magnetic anomalies in a central area of Ellsworth Land suggest a deeper basement and possibly a thick metasedimentary section associated with that of the Ellsworth Mountains. An 18-km refraction profile showed velocities of 3.87 km/sec in the top 0.9 km of ice, 4.4 km/sec in the next 0.3 km, 8.3 km/sec in the next 3.6 km, and a possible 6.0 km/sec in the rock below. The mean free-air anomaly in Ellsworth Land is  $+11$  mgal indicating that the area is approximately in isostatic equilibrium. The southern Antarctic Pen-

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sula is regionally compensated. The data tabulated or presented in graphical form include: position, elevation of snow and rock surfaces, observed gravity, free-air anomaly, and total magnetic intensity at 8-km intervals; Bouguer anomalies at all seismic soundings or rock outcrops; reflection travel times for each seismic sounding of ice thickness; geological observations at 11 nunataks; P-wave velocity in the firm vs. depth and distance data, and density vs. depth curves in the firm at all reflection stations; graphs of diurnal variation of magnetic total intensity for 20 days compared with Eight Station diurnal curves; and reproductions of portions of reflection seismograms. (Author's abstract, modified)

SIP 22454

91(08)(+76)  
551.324.3(+701)

Robinson, Edwin S.  
RESULTS OF GEOPHYSICAL STUDIES ON THE  
McMURDO TO SOUTH POLE TRAVERSE. Res. Rept.  
Ser. No. 62-8, Wisconsin Univ. Geophys. & Polar  
Res. Center, Dept. Geol., 49p. incl. tables, graphs,  
map, appendixes 1-3, Nov. 1962. 12 refs.  
DLC, Tech. Rept. Collection.

Geophysical studies were conducted on the McMurdo to South Pole Traverse, Dec. 10, 1960 to Feb. 12, 1961. Fourteen major stations and 267 minor stations were made. Studies of barometric altimetry and gravimetric and magnetic observations were conducted at all stations, with seismic reflection and refraction recordings taken at major stations. The surface elevation profile shows many wave-like features and a significant high at 88°S, 170°W, where the elevation is over 3100 m above sea level. The rock surface profile shows that the Transantarctic Mountains do not extend far inland but decline in elevation to below sea level. The rock surface rises to about 1000 m above sea level beneath the ice surface high discussed above. Bouguer anomalies indicate that this part of Antarctica has a continental crustal section. Pertinent data are tabulated in Appendix 1, and photocopies of representative seismic records are given in Appendix 2. -- JFS

SIP 22455

551.515.8(+7)

Taljaard, J. J. and H. van Loon  
CYCLOGENESE, CYCLONES AND ANTICYCLONES  
IN THE SOUTHERN HEMISPHERE DURING THE  
WINTER AND SPRING OF 1957. Motoc, 11(1/4):3-20  
incl. graphs, charts, 1962. 3 refs.  
DLC, QC962.N6

Charts of the positions of sea-level cyclone and anticyclone centers in the region south of 15°S for the cold season (July-Sept.) and for the spring transition period (Oct.-Nov.), 1957, are presented. The cyclone centers are indicated separately for each month and collectively for the cold season. The anticyclone centers are indicated together for each of the two

periods. Cyclone and anticyclone tracks are given for July and Oct. Centers of cyclogenesis are indicated separately for the cold and transitional seasons. Charts of the positions of 500-mb geopotential minima are presented for each month, and the tracks of the July minima given. The main features of all the charts are described and brief explanatory notes on some of these features and their significance are added. (Authors' abstract)

SIP 22456

551.510.5:551.524.7:551.557.5(+7)

Kotmeyer, W. L.  
A STUDY OF AVERAGE JANUARY AND JULY  
AEROLOGICAL CONDITIONS ALONG THE 10°E  
CROSS-SECTION IN THE SOUTHERN HEMISPHERE.  
Notes, 11(1/4):21-30 incl. tables, graphs, 1962. 14  
refs.  
DLC, QC962.N6

Upper-air temperatures, dew points, geopotentials and winds are considered for July 1957, Jan. and July 1958 and Jan. 1959 along the 10°E cross section at 10°E in the Southern Hemisphere. The 13 stations include Gough and Marion Islands, and Norway [SANAE], Halley Bay, Amundsen-Scott, and Little America Stations. The average meridional profiles of temperature for Jan. reflect a surface inversion between 15° and 30°S (west coast effect), high-level cold cores between 0° and 20°S and over Antarctica, and a relatively warm core above the pole. In July pronounced surface inversions appear between 0° and 30°S and south of 60°S (radiation effect), while two high-level cold cores at the equator and pole are separated by an isothermal column of appreciably higher temperature. The tropopause experiences a break in temperature latitudes in summer and winter. The tropopause drops more steeply between equator and pole in Jan. than in July, while in the latter month it rises again between 30°S and 75°S. Meridional gradients of temperature are greatest in the troposphere between 35° and 40°S in Jan. and between 25° and 35°S in July. These gradients conform to observed troposphere zonal jet streams in both seasons, while a stratospheric jet appears at 60°S in winter. In July average westerly zonal winds south of about 55°S increase in velocity through all levels. Easterly winds are evident over the equator and at lower levels near 70°S. (Author's abstract, modified)

SIP 22457

551.515.13:322(+836:+831)

Loon, H. van  
ON THE MOVEMENT OF LOWS IN THE ROSS AND  
WEDDELL SEA SECTORS IN SUMMER. Motoc, 11  
(1/4):67-80 incl. maps, 1962. 5 refs.  
DLC, QC962.N6

By means of cyclone tracks and a mean pressure map, it is shown that, in summer, (1) the Ross and Weddell Seas are less preferred as seats of central

lows than other parts of Antarctic waters, and (2) their role as "graveyards" for migratory cyclones is unlikely to be greater than that of other regions in the sub-Antarctic. (Author's abstract)

SIP 22458

551.557.5(82/83:\*821)

Alvarez, J. A.  
SOME FEATURES OF JET-STREAMS OVER THE SOUTHERN PARTS OF SOUTH AMERICA. *Notos*, 11(1/4):67-75 incl. tables, graphs, maps, 1962. 9 refs.  
DLC, QC982.N6

The geostrophic approximation was used in conjunction with the few available upper winds over the southern parts of South America to prepare 110 isotach analyses for the period Aug.-Nov. 1958. Data from 14 radiosonde stations, including Orcadas, Argentine Island, and Ellsworth Stations, were used for the analyses. The observed jet streams are studied in relation to surface fronts, to the isotherms at two intermediate standard levels and to cyclogenetic and precipitation areas. In spring the Polar and Antarctic Fronts appear to be respectively correlated with the positions of the -15° and -30° C isotherms at the 500-mb level and with the -42° and -55° C isotherms at the 300-mb level. In spring jet streams in the South American region are most frequently located between 30° and 40° S and east of the Drake Passage. The relationships between jet streams and zonal index, precipitation, cyclogenesis, range of speed and wind shear are in fair agreement with Northern Hemisphere observations. The correlation between wind maxima and middle and high cloud is not in good agreement with Northern Hemisphere observations. A special cloud reporting network is necessary for a more complete study of the latter relation. (Author's abstract, modified)

SIP 22459

551.509.21(\*7)

HISTORICAL WEATHER CHARTS FOR THE SOUTHERN HEMISPHERE FOR THE YEAR 1959. *Notos*, 11(1/4):95-159 incl. charts, 1962. 3 refs.  
DLC, QC982.N6

Daily weather charts for the Southern Hemisphere for Jan. and Feb. 1959 are published in continuation of the series of daily charts for the EGY. Subsequent charts will be published in following numbers of *Notos*. The series includes a daily sea-level chart for 1200 GMT and a daily upper-air chart for the 500-mb level. The data coverage is similar to that for the EGY period, and has been improved in certain areas. The Antarctic network established for the EGY was maintained. Time sections of the surface observations of the four main synoptic hours are prepared for 55 selected stations in middle and high latitudes. Time sections of temperature, dew point,

and wind at 850, 700, and 500 mb and the thickness 1000/500 mb are prepared for 21 selected upper-air stations in middle and high latitudes. Full TEMP reports up to 300 mb including upper winds, are plotted for 19 selected stations in higher latitudes. The procedure involved in the construction of the 500-mb contour charts is described. -- JFS

SIP 22460

551.5:621.396(\*3)

Landmark, B. (ed.)  
ARCTIC COMMUNICATIONS. (Proceedings of the Eighth Meeting of the AGARD Ionospheric Research Committee, Athens, Greece, July 1963). New York, Pergamon, Press, 297p. incl. tables, graphs, diagrs., maps, 1964.  
DLC, TL500.N6

This book presents 22 papers by various authors on Arctic Communications. Five papers deal with the physical properties of the Arctic ionosphere, 7 discuss Arctic high frequency communications, 7 deal with the analysis of soundings and field strength measurements, and 2 discuss observations which were made during nuclear tests. Five of the papers are in French. -- BLE

SIP 22461

551.465(+662:\*682)

Fedorova, Z. P. and Z. S. Ankina  
THE PASSAGE OF PACIFIC OCEAN WATER THROUGH THE BERING STRAIT INTO THE CHUKCHI SEA. (Postuplenie tikhookeanskoi vody cherez Beringov proliv v Chukotskoe more; Text in Russian). *Okeanologiya*, 3(5):777-784 incl. tables, graphs, 1963. 12 refs. (Eng. transl.: Deep-Sea Res. 11(3):427-434, July 1964)  
DLC, Slavic Div.

This article discusses data, observations, and estimations concerning water exchange through the Bering Strait. The rate of water flow through the strait into the Chukchi Sea, first calculated by Ratmanov (1932-1933), was 100-120 km<sup>3</sup>/24 hr during the summer. This figure was also obtained by Stockmann in 1955. Using a more objective method in 1959, L. G. Toporkov calculated the 24-hr flow rates from June 20 to Oct. 15 from current observations made in 1958 at a Buoy Station, and compared them with the total current velocities. He established an average 24-hr flow of 100 km<sup>3</sup>. The authors used this method to estimate the flow rate for a period of 21 yr. The result is provisional for the entire strait. If the water temperature at the Polar Station on Ratmanov's Island is known, it is possible to calculate the mean temperature of the entire Bering Strait for a given period. From data at polar stations, the transition from winter to spring and summer temperatures is observed in the third week of May. At first the water temperature increases very rapidly, and as early as the third week of June it

reaches  $-1.0^{\circ}\text{C}$  to  $+1.5^{\circ}\text{C}$ . The warm flow through the strait varies greatly from year to year. The quantity of heat carried annually into the Chukchi Sea by the Pacific Ocean is sufficient to melt the ice over half the sea. An equation is given which makes it possible at the end of May to forecast the rate of water flow in Bering Strait for the next month. -- BLE

SIP 22463

551.506.22(+7)

Peavey, Ross C. and Laurence M. Gould  
ANTARCTICA, INTERNATIONAL LAND OF  
SCIENCE. UNESCO Courier, No. 1:8-14, incl.  
illus., Jan. 1962.  
DLC, AS4, U8A14

The IGY was the first large-scale and concerted international effort to investigate Antarctica scientifically. A few of the more significant aspects of international collaboration are discussed and include (1) an IGY International Antarctic Weather Central to conduct meteorological research and disseminate daily weather forecasts to all stations, (2) an exchange scientist program, (3) a radio communications network, (4) a comprehensive study of the ice cap, involving several traverses by individual countries, (5) a program of stations operated jointly, as in the case of the New Zealand-U.S. Hallett Station, and (6) cooperation of logistics facilities and assistance. Some significant contributions of these programs include (1) the purely scientific results and their meanings, (2) the practical values of the research, as with the broader knowledge of Southern Hemisphere meteorology and radio communications, (3) the scientific associations and collaboration of scientists from many countries, and (4) the successful negotiation of the Antarctic Treaty. The latter is a unique contribution in that it provides for international scientific cooperation for 30 years, with exchange of personnel between expeditions and stations and free interchange of observations and results. -- JFS

SIP 22463

613.48:612(+7)

Stple, Paul A.  
LIVING AT  $70^{\circ}\text{C}$ . BELOW ZERO. UNESCO Courier,  
No. 1:21-28 incl. illus., Jan. 1962.  
DLC, AS4, U8A14

Living and working in Antarctica is possible if several elementary rules are followed. Knowing how much clothing to wear can be very important, since getting overheated while working may result in excessive perspiration and later chilling. Although there is a wide variety in clothing from station to station and sometimes an equal diversity from man to man in any single station, the basic principles are nearly the same. In summer, when temperatures range between  $0^{\circ}\text{C}$  and  $-30^{\circ}\text{C}$ , outside workers wear surprisingly light clothing. Footwear varies widely, and is usually ski boots, mukluks, or double-layer insulated boots. Hand gear is usually in two layers--a wool mitt with

a leather or canvas protective cover. Head gear ranges from the conventional wool cap to leather or fabric helmets with ear flaps. Winter clothing follows the same principles, but increases in thickness or number of layers, and usually has more positive closures to keep out the wind. Head gear, boots and mitts increase to optimum values. If heat production is increased by activity, sufficient clothing will keep a man warm at temperatures down to  $-70^{\circ}\text{C}$ . This was demonstrated at the South Pole, where two men stayed outdoors for three and four hours while wearing about 12-13 kg of clothing in several layers. Fortunately for Antarctic workers, the body adjusts by an acclimatization process to conserve its heat better and tolerate the sensation of cold. Also, pain sensation due to cold does not increase proportionately to the degree of coldness. Station construction during the IGY is discussed, especially concerning buildings and their proper insulation. -- JFS

SIP 22464

551.33.016:551.506.2

Comité International de Géophysique  
CATALOGUE OF DATA IN THE WORLD DATA  
CENTERS FOR THE PERIOD OF THE INTERNATIONAL  
GEOPHYSICAL YEAR AND INTERNATIONAL  
GEOPHYSICAL COOPERATION - 1959  
(1 JULY 1957 - 31 DECEMBER 1959). IX. GLACIOLOGY. Annals IGY, 38:295-343 incl. table,  
map, 1964.  
DLC, QC801.3.88

Glaciological data for the IGY/IGC-59 have been collected, exchanged, and made permanently available to the scientific community through World Data Centers A, B, and C. This catalogue consists of a listing of the glaciology reports received by the WDC's. Titles are arranged by sponsoring country and station number and name. All reports are in the language of the sponsoring country unless otherwise noted. Original sources of printed or mimeographed reports, except articles in journals, are given in parentheses following the titles. The distribution of stations that participated in the IGY/IGC-59 glaciology program is shown on the map. Glaciology stations and programs for which reports or information have been received in the WDC's are listed under the participating committee that sponsored that station or program. Data are also arranged by author with subject and regional indexes included. -- BLE

SIP 22465

551.4:551.336:551.75(+33-413-+37)

Vasil'ev, B. P.  
ISLAND SHELVES OF THE NORTH ATLANTIC.  
(Ostrovnye shel'fy Severnogo Atlantiki; Text in Russian). Priroda, No. 8:96-97 incl. graphs, map, 1964. (Eng. transl.: Directorate of Scientific Information Services, DRB, Canada, T 406 R, Aug. 1964)  
DLC, Q4, P6



Data are discussed which were obtained during the voyage of the scientific training ship *Batalisk* around the coastal shelves of Iceland, Ireland, and the Hebrides and Faeroe Islands. Itinerary studies of the relief and the superficial bottom sediments revealed much in common in the topography of low submarine hills, valleys, and sunken terraces, and this was well reflected in the echograms. All the relief forms are of glacial character. The origin of the submarine valleys may be explained by the plowing action of the ice sheet. These forms might also be ancient river valleys worked over by the ice sheet, but none of them is traceable on shore in the islands. The submarine terraces (at a depth of 150 m) are of Quaternary age; during the glacial period they represented shore lines. An examination of coarse detrital material collected at geological stations over the shelf zone indicates that the pebbles are most likely of hydraulic-glacial-peleag origin. Petrographic analysis points to the provinces from which these pebbles were transported. -- BLE

SIP 22466

551.579.2(77)

Weather Bureau  
FREQUENCY OF MAXIMUM WATER EQUIVALENT OF MARCH SNOW COVER IN NORTH CENTRAL UNITED STATES. Tech. Paper No. 50, Washington, 24p. incl. tables, graphs, maps, 1964. 3 refs.  
DLC, Tech. Rept. Collection

Maximum water-equivalent values of snow cover for the first and second halves of March are presented for probabilities of 50, 20, 10, 4, 2, and 1%. The region covered is north of 40°N, between 80° and 105°W. Basic data for the study was obtained from the records of 61 Weather Bureau first-order stations. The average record length of water-equivalent observations at the various stations is 9 yr. A secondary snow-depth network of 463 stations supplemented the water-equivalent network. Use was also made of published snowfall data. The maximum observed values of water equivalent in both the first and latter halves of March varied from slightly less than 1 in. along the southern and western edge of the region to over 6 in. over northern Michigan. About two-thirds of the stations observed their maximum values in the first half of March. Equations are given for estimating maximum water equivalent, and the construction of water equivalent maps is discussed.  
-- BLE

SIP 22467

551.513(7)

Shapaev, V. M.  
SYNOPTIC INVESTIGATIONS DURING THE THIRD ANTARCTIC SEA EXPEDITION OF 1957-58. (Sinopticheskie issledovaniia v period Tret'ei morskoi Antarkhticheskoi ekspeditsii 1957/58 g.; Text in Russian). Sovet. Antarkhticheskai Eksped., Inform. b'ull., No. 4:23-25, 1959. Eng. transl. in: Soviet Antarctic Expedition, Information Bulletin. Vol. 1, Amsterdam, Elsevier, 1964, p. 179-180.  
DLC, Q115.S686; Q115.S6863

Based on surface synoptic data, 3 zones of atmospheric circulation crossing from the equator to the Antarctic coast are distinguished. The equatorial latitudinal zone (0-20°) is characterized by a dissipated pressure field in which individual closed centers, slow-moving fronts and zones of intertropical convergence occasionally develop. The sub-tropical high pressure belt (20-45°S) consists of individual centers (anticyclones) moving at low speeds from west to east and is dynamically unstable. The third zone consists of regions of cyclonic activity originating at the temperate and Antarctic fronts. The Antarctic front is situated on the coast and moves north in summer to 65-60°S, at which time there is a definite relationship between cyclonic activity at the Antarctic front and the Antarctic anticyclone consisting in anticyclonic intensification coupled with a flow of cold air toward the seas. As a result, temperature contrasts increase and cyclonic activity intensifies. -- JFS

SIP 22468

551.524.3:551.524.7(\*746)

Kovrova, A. M.  
SOME CHARACTERISTICS OF THE TEMPERATURE REGIME IN THE FREE ATMOSPHERE OVER ANTARCTICA. (Nekotorye kharakteristiki temperatur-nogo rezhima svobodnoi atmosfery nad Antarktidoi; Text in Russian). Sovet. Antarkhticheskai Eksped., Inform. b'ull., No. 4:27-31 incl. table, graphs, 1959. Eng. transl. in: Soviet Antarctic Expedition, Information Bulletin. Vol. 1, Amsterdam, Elsevier, 1964, p. 181-184.  
DLC, Q115.S686; Q115.S6862

Mean monthly temperature variations are greatest in the lower troposphere and lower stratosphere with abrupt changes occurring during the transition from winter to spring. Lapse rate is low in the first 2 kilometers of the troposphere, and is determined by frequent surface inversions and isothermal conditions in the layer. Deeper inversions (maximum average = 1030 m) would occur except for the prevailing strong winds. Temperature extremes at Mirny ranged from a high of 3.1°C on Dec. 20 to a low of -34.0°C at the surface, and -77.8°C at 100 mb in July. The height of the tropopause averages from 9100 to 9500 m. Lowest stratospheric temperatures are recorded in July, and the lapse rate becomes isothermal in the lower stratosphere in Aug. The tropopause is sharply defined in Sept., and the temperature gradually increases beginning from a height of 11 km. In Oct. and Nov., the lapse rate in the lower stratosphere increases, and the entire troposphere warms in Nov. -- JRT

SIP 22469

551.555.3:551.555.9(\*746)

Rusin, N. P.  
DRAINAGE WINDS AT THE COAST OF EAST ANTARCTICA. (Stokovye vetry na poberezh'e Vostochnoi Antarktidy; Text in Russian). Sovet. Antarkhticheskai Eksped., Inform. b'ull., No. 4:23-25, 1959. Eng. transl. in: Soviet Antarctic Expedition, Information Bulletin. Vol. 1, Amsterdam, Elsevier, 1964, p. 179-180.  
DLC, Q115.S686; Q115.S6863



Eksped., Inform. bŭll., No. 4:33-36, 1959. Eng. transl. in: Soviet Antarctic Expedition, Information Bulletin, Vol. 1, Amsterdam, Elsevier, 1964, p. 184-187.  
DLC, Q115.S686; Q115.S6862

Drainage winds, caused by the pressure gradient and the force of gravity, occur on the East Antarctic coast where the southerly wind component coincides with the general surface slope. The conditions of their formation, development and renewal are discussed. During formation, i.e., when a transition from cyclonic to anticyclonic conditions takes place, adiabatically warmed air descends the glacier slope, a true foehn wind develops, accompanied by a drop in humidity, a rise in air temperature and a decrease in wind velocity at the surface. As cold air replaces the warm air, the temperature drops rapidly, the wind velocity increases at the surface and decreases at height, and turbulent vortexes develop with strong gusts in the lower air layer. The resultant drainage winds are characteristically wavelike both in temperature and wind velocity variations. Daily drainage wind variations are pronounced from spring through autumn with maximum velocities occurring at night and early morning followed by a minimum. They are always associated with adiabatic warming, and keep the temperature and wind velocity higher at Mirny than at nearby sites on the shore ice. During the transition from anticyclonic to cyclonic conditions, the drainage winds weaken, again, acquiring the nature of foehn winds. -- JRT

SIP 22470 551.555.3:551.578.42(\*746)

Voronov, P. S.  
WORK CONDUCTED AT AN OUTLYING STATION.  
(Rabota vyosnoŭ stanŭii; Text in Russian). Sovet. Antarktičeskaf Eksped., Inform. bŭll., No. 4: 37-41 incl. illus., 1959. Eng. transl. in: Soviet Antarctic Expedition, Information Bulletin, Vol. 1, Amsterdam, Elsevier, 1964, p. 187-191.  
DLC, Q115.S686; Q115.S6862

Complex meteorological and glaciological observations were conducted in Aug. 1956, at 4 outlying stations established at Mirny to study the katabatic winds which develop from the drainage of cooled lower air along the slope of the ice cap. Two main wind directions prevailed, one E or ESE cyclonic, and the other, SSE katabatic. The katabatic winds were the most prolonged (65% of the time), often reached gale force, and were accompanied by a temperature drop. Temperature differences up to 1.5°C were often recorded between the surface and a height of 2 m. The highest velocity occurred during cyclonic winds. Snow depth variations indicated a stadial or wavelike movement of snow from the interior to the ice barrier and farther on to the shore ice after each fresh snowfall. The main snow mass is transported by katabatic winds in the air layer near the ground and deposited on the lee side of the coastal barrier. Thus, coastal barriers play the role of natural snow drift meters. -- JRT

SIP 22471 551.515.1:551.515.8(\*7)

Astapenko, P. D.  
CYCLONIC ACTIVITY IN THE HIGH LATITUDES OF THE SOUTHERN HEMISPHERE IN WINTER. (O cikloničeskoi deŭitel'nosti v vysokikh širokakh ŭžnogo polušar'fā v zimnee vremā; Text in Russian). Sovet. Antarktičeskaf Eksped., Inform. bŭll., No. 5:26-31 incl. illus., 1959. Eng. transl. in: Soviet Antarctic Expedition, Information Bulletin, Vol. 1, Amsterdam, Elsevier, 1964, p. 225-229.  
DLC, Q115.S686; Q115.S6862

Synoptic charts of the Antarctic winter show that cyclonic activity does not cease during the polar night. Atmospheric fronts are of great importance (even during winter months) and are the most significant source of weather element variations. The trajectories of depressions fall into 2 major categories: (1) circular, which consist of several sections located over the coast interspersed with filled depressions; and (2) meridional, which are composed of 8 branches (each about 500 km wide) along which depressions move from temperate latitudes to the coast where the circular and meridional types meet. The depressions then move either along the coast or deflect inland depending on the intensity of the processes. Cyclones generally move from west to east along the path of the circular group of trajectories, although they are occasionally deflected north by an anticyclonic ridge developed in the direction of the ocean. In their movement from west to east, the depressions do not circle the continent, but fill and remain in front of one of the high pressure cols, or proceed to the continent. They penetrate the interior only several times a month, and rarely cross the entire continent, indicating that they fill on the way or reach the pole in the form of a trough. -- JRT

SIP 22472 551.510.52/.53(\*7)  
551.524.77/.78(\*7)

Astapenko, P. D.  
VERTICAL STRUCTURE OF THE ATMOSPHERE IN THE ANTARCTIC. (O vertikal'noi strukture atmosfery Antarkiki; Text in Russian). Sovet. Antarktičeskaf Eksped., Inform. bŭll., No. 6:23-26 incl. diag., map, 1959. Eng. transl. in: Soviet Antarctic Expedition, Information Bulletin, Vol. 1, Amsterdam, Elsevier, 1964, p. 263-267.  
DLC, Q115.S686; Q115.S6862

The structure of the lower stratosphere and the troposphere on July 4, 1958, was constructed based on a vertical profile of the atmosphere up to 32 km, following the 168° E meridian south from Norfolk Island (29° S) through the South Pole and north along the 58° W meridian to Port Stanley (52° S). The tropopause is the boundary between the westerly winds of the stratosphere and the easterly winds of the troposphere. Thus, air currents of the lower atmosphere do not propagate into the stratosphere. During the polar night the entire atmosphere over Antarctica is colder than at lower latitudes over the oceans. In summer, the Antarctic remains a source

of cold only in the lower layers. In the upper layers, above 10 km, it is unusually warm in summer and the horizontal temperature gradient has a sign opposite to that of winter. The annual amplitude of temperature variations in the Antarctic is smaller at the surface than in the stratosphere. -- JRT

SIP 22473

551.524.4/.7:551.547.3(\*746:\*3)

Dolgin, I. M. and S. I. Sokolov  
CHARACTERISTICS OF THE DISTRIBUTION OF  
METEOROLOGICAL ELEMENTS AT MIRNY AND  
AT DRIFTING STATIONS. (Osobennosti rasp-  
delenia meteorologicheskikh elementov v Mirnom i na  
dreflulushchikh stantsiyakh; Text in Russian). Sovet.  
Antarkticheskaya Eksped., Inform. biull., No. 7:  
13-17 incl. tables, graphs, 1959. 2 refs. Eng.  
transl. in: Soviet Antarctic Expedition, Information  
Bulletin. Vol. 1, Amsterdam, Elsevier, 1964, p.  
290-294.  
DLC, Q115.S686; Q115.S6862

Aeroclimatic characteristics computed for Mirny  
Station were compared with similar characteristics  
at the Arctic drifting stations, "North Pole-4" and  
"North Pole-6," for July 1956 and Jan. 1957. At  
Mirny, the temperature is generally lower in the  
entire atmospheric layer in summer and in the upper  
troposphere and stratosphere in winter than it is in  
the central Arctic. Atmospheric pressure at sea  
level is 15-30 mb lower at Mirny than in the corre-  
sponding seasons in the Arctic. This difference  
gradually decreases but remains equal to 10 mb at  
the tropopause level, possibly confirming the exist-  
ence of a low pressure region with its center over  
Mirny. Stronger winds, especially in winter, are  
characteristic of winter at Mirny. Wind increases  
at the tropopause level in both seasons, and its  
further increase in the stratosphere in winter and its  
decrease in summer are characteristic for Mirny.  
-- JRT

SIP 22474

551.555.4(\*746)

Dolganov, L. V.  
TEMPERATURE AND HUMIDITY VARIATIONS DUR-  
ING KATABATIC WIND. (Ob izmenenii temperatury i  
vlazhnosti pri stokovom vetre; Text in Russian).  
Sovet. Antarkticheskaya Eksped., Inform. biull., No.  
7:18-21 incl. tables, graph, 1959. 5 refs. Eng.  
transl. in: Soviet Antarctic Expedition, Information  
Bulletin. Vol. 1, Amsterdam, Elsevier, 1964, p.  
294-297.  
DLC, Q115.S686; Q115.S6862

The continental anticyclone, as well as persistent in-  
version and katabatic wind development, is associated  
with radiational cooling of the smooth surface of the  
relief slope in the Mirny region. The relationship  
between temperature and wind drainage at the coast  
is well defined, especially in spring when the daily  
variation in katabatic winds is more pronounced.

The katabatic winds not only affect temperature ex-  
tremes but also displace the time of their occur-  
rence. The difference between relative humidity in  
the interior (Pionerskaya) and at the coast is greatest  
on days with katabatic winds. -- JRT

SIP 22475

551.590.21(\*7)

Elgenson, M. S.  
ANTARCTIC ICE, CLIMATIC VARIATIONS, AND  
SOLAR ACTIVITY. (L'dy Antarktiki, koleban'ia  
klimata i solnechnaya aktivnost'; Text in Russian).  
Sovet. Antarkticheskaya Eksped., Inform. biull.,  
No. 8:8-11, 1959. 3 refs. Eng. transl. in: Soviet  
Antarctic Expedition, Information Bulletin. Vol. 1,  
Amsterdam, Elsevier, 1964, p. 317-319.  
DLC, Q115.S686; Q115.S6862

A sharp drop in the secular variation of solar activity  
is forecast for the last 4 decades of the 20th century,  
unless some presently unknown supersecular cycle  
should change this pattern. If this drop in activity  
occurs, ice conditions will deteriorate in the Antarc-  
tic, and the melting of the ice cap will slow down or  
cease, possibly being replaced by ice formation.  
Because of the changing nature of the solar activity  
cycle, Antarctic ice evolution studies will acquire  
significant physiographic and heliogeophysical im-  
portance in the next decades. -- JRT

SIP 22476

551.555.4(\*746)

Dolganov, L. V.  
KATABATIC WIND VELOCITIES IN THE MIRNY-  
PIONERSKAYA AREA. (Skorost' stokovogo vetra v  
raione Mirny-Pionerskaya; Text in Russian). Sovet.  
Antarkticheskaya Eksped., Inform. biull., No. 8:12-  
15 incl. tables, 1959. 4 refs. Eng. transl. in:  
Soviet Antarctic Expedition, Information Bulletin.  
Vol. 1, Amsterdam, Elsevier, 1964, p. 320-323.  
DLC, Q115.S686; Q115.S6862

Katabatic wind velocities at the coast (Mirny) and  
375 km inland (Pionerskaya) were compared, and  
found to remain high throughout the year. Drainage  
speeds at the coast increased from 7-11 m/sec from  
summer to winter, whereas less abrupt changes were  
noted inland. The difference in velocities inland and  
at the coast was greatest in winter months when the  
average velocities of other types of winds are also  
greatest. The steady southeasterly direction of the  
katabatic wind and its fundamental role in the wind  
regime suggest that radiational cooling and the length  
angle of inclination of the slope are the basic factors  
determining katabatic wind velocity. -- JRT

Gordienko, P. A.  
METEOROLOGICAL CONDITIONS DURING THE  
NAVIGATION OF THE LENA ALONG THE COAST  
OF EAST ANTARCTICA IN 1957. (Meteorologicheskoe usloviya v period plavaniya d/e "Lena" vdol' beregov Vostochnoy Antarktidy v 1957 g.; Text in Russian). Sovet. Antarkticheskaya Eksped., Inform. b'ull., No. 9:21-27 incl. illus., table, graphs, 1959. Eng. transl. in: Soviet Antarctic Expedition, Information Bulletin. Vol. 1, Amsterdam, Elsevier, 1964, p. 351-355.

DLC, Q115.S686; Q115.S6862

This article describes meteorological processes observed along the Antarctic coast between Mirnyy and Lützow-Holm Bay from Jan. to April 1957. Atmospheric circulation from Jan. to March was characterized by the interaction of Antarctic cyclones moving from west to east, the stable Antarctic anticyclone, and moving subtropical anticyclones. A persistent zone of Antarctic cyclones exists between 45°-50°S and the coast. The prevailing wind direction in the coastal zone conformed to the atmospheric circulation. Easterly and southeasterly winds persisted along the entire coast, an important index to the cause of formation of ice conditions. Air temperature decreased sharply in the coastal region, and steady ice formation began in early March. Snow fell on the coastal zone 22% of the time in the summer-autumn season. -- JRT

Shapaev, V. M.  
WEATHER CONDITIONS DURING THE STORM OF  
MARCH 29-30, 1958, OFF THE BALLENY ISLANDS.  
(Osobennosti pogody vo vremya shtorma 29-30 marta 1958 g. v raione o-vov Balleny; Text in Russian). Sovet. Antarkticheskaya Eksped., Inform. b'ull., No. 9:28-30 incl. table, graph, 1959. 1 ref. Eng. transl. in: Soviet Antarctic Expedition, Information Bulletin. Vol. 1, Amsterdam, Elsevier, 1964, p. 356-358.

DLC, Q115.S686; Q115.S6862

Weather conditions near the Balleny Islands and the position of the Ob' from which the observations were made are described in detail. Hourly values of cloud cover, precipitation, pressure, wind, air and water temperature, and of absolute humidity are presented graphically. The hurricane, wind velocities and other reported conditions resulted from one of the deep cyclones in the vicinity of the islands. Soundings from the Ob' confirmed an intensive inflow of marine polar air from lower latitudes. Wind velocities in the 5- to 8-km layer were characteristic of the jet stream. Soundings at 15 km showed a value of 100 m/sec which is somewhat doubtful. Wind directions and velocities at 1123 hours on March 30 are tabulated for 0.5 km and for each kilometer up to 9.0. -- (Meteorol. and Geostrophys. Abstracts)

Dolgin, I. M. and others  
RESULTS OF METEOROLOGICAL OBSERVATIONS  
IN THE ARCTIC AND IN ANTARCTICA. (Rezultaty meteorologicheskikh issledovaniy v Arktike i Antarktike; Text in Russian). Trudy Vses. nauch. meteorol. soveshch. 1:58-71 incl. table, graphs, diagrs., 1962.

DLC, QC851.V852

After a short history of the development of meteorological observations in the Arctic and Antarctic, these regions are compared as to temperature, atmospheric structure, and wind. Mean annual temperatures are -20° C (Arctic) and -55° C (Antarctic); minimum temperatures are -50° C and -90° C, respectively. The mean annual temperature of the free atmosphere up to 16 km is only about 5-10° C lower over the Antarctic. Stratospheric temperatures of both regions are about the same in summer, but 5-15° C warmer in the Arctic in winter. The annual variation of the troposphere is much greater over the Arctic than over the Antarctic, although the reverse is true of the stratosphere. Mean annual wind velocities are 10-20 m/sec in the Antarctic and 3-5 m/sec in the Arctic, with maxima at 90 and 40 m/sec, respectively. Maximum wind velocities near the tropopause in both regions are 15-20 m/sec. Meteorological observations were instrumental in initiating sea and air travel in polar regions and economical development in the Arctic. Arctic studies have shown that about 90% of the Arctic basin is covered with ice, and in summer, ice covers 18-36% of Arctic seas. -- (ATD abstract; modified)

U. S. Weather Bureau  
CLIMATOLOGICAL DATA FOR ANTARCTIC STATIONS, JANUARY-DECEMBER 1961, NUMBER 4.  
Washington, 144p incl. tables, 1964.  
DLC, Tech. Rept. Collection

This publication summarizes meteorological observations collected at Amundsen-Scott, Byrd, Ellsworth, Hallett and Wilkes Stations for the period Jan.-Dec. 1961. Conventional surface weather elements were generally recorded at 3-hourly intervals on forms WBAN-10A and 10B. Peak gusts of wind speed were recorded for all stations except Ellsworth. Monthly precipitation amounts are included where available from the records. Conventional upper-air observations were made at all stations except Ellsworth. Chemical data (carbon dioxide) is available for Amundsen-Scott only. Radioactivity, ozone, and radiation data were not available for this publication. -- JFS

SIP 22481 551.593.7:551.521.14:551.578.4(\*747)

Schwerdtfeger, Peter

**EFFECT OF POLARIZATION ON THE ALBEDO.**

Nature, 202(4935):894, May 30, 1964. 3 refs.

DLC, Q1.N2

Albedo observations made between Wilkes Station and the nearby Station "S-2" showed that in the direction of the wind, the light from the surface is 20-22% polarized, while at right angles the polarization decreases to about 7%. The polarization was independent of larger-scale surface features at any one locality, evidently being dependent on particle and crystal orientation of the surface snow. A duplicate sequence of measurements was made to ensure that polarized sky light was not contributing significantly to the observed effect. Only in high latitudes does sky radiation assume importance, and then only when the sun is less than 5° above the horizon. Tests are planned for the albedo of wind-swept sand surfaces, which should show similarities to the albedo of snow. -- JFS

SIP 22482

(82)629.13(\*7)

Olezza, Mario Luis

**POLAR PROJECTION FOR THE SOUTHERN HEMISPHERE AND SUCCESS OF A FAILURE.** (Proyección polar para el hemisferio sur y el éxito de un fracaso; Text in Spanish). Rev. Nac. Aeronaut. y Espacial, 23(251):22-28 incl. illus., maps, April 1963. 2 refs.

DLC, TL504.R547

This article discusses American, Russian, and Argentine efforts to establish a transpolar air route over the Antarctic continent. Argentine air operations in the Antarctic in 1962-63 are described, including the problems connected with airplane takeoff from snow and ice, such as the required increase in engine horsepower, the reduction of weight, the construction of runways on ice, and the construction and installation of the "quid" for jet-assisted takeoff. The quid is a frame that supports the auxiliary rockets used for takeoff from ice and snow. -- International Aerospace Abstracts

SIP 22483

551.506.22(084.3)(\*7)

South Africa. Weather Bureau

**INTERNATIONAL GEOPHYSICAL YEAR WORLD WEATHER MAPS, PART III: SOUTHERN HEMISPHERE SOUTH OF 20°S. MARCH, 1958.** Pretoria, [1964] 65p. incl. maps. 5 refs.

DLC, GPRR

The IGY World Weather Maps consist of a daily series of maps for the period July 1, 1957, through Dec. 31, 1958. The maps are published as monthly booklets in three parts, each containing a sea-level and a 500-mb map for 1200 GMT. Part III, 20°S to

the South Pole, contains daily maps at a polar stereographic projection with true scale of 1 to 50 million along lat. 60°S. The 6-hourly surface observations of about 60 stations, including the isolated island and Antarctic stations, were used to produce the sea-level maps. Data from 60-70 radiosonde stations, plus visual and electronic wind soundings, were used to produce the 500-mb maps. An extrapolation procedure was devised to obtain realistic 500-mb heights over the oceans. No attempt was made to reduce the pressures of Antarctic plateau stations to sea level except for Byrd Station. -- JFS

SIP 22484

551.524(\*701)

Roberts, Charles L. and Harry R. Spohn

**-109.8° F. -A WEATHER BUREAU RECORD:**

Weatherwise, 17(2):58, 97, April 1964.

DLC, QC851.W42

The lowest official air temperature ever recorded by the U.S. Weather Bureau was observed at Amundsen-Scott Station on July 14, 1963. The temperature reached -109.8° F at 1125 GMT, exceeding the previous record low set in Sept. 1959 at this station by 0.3° F. The world's lowest temperature (-126.9° F) occurred at Vostok Station. The record low at Amundsen-Scott occurred during a period when surface temperatures were below -100° F for 15 hours. Winds of 4 knots (ESE grid) died out for 20 minutes, at which time the record low was recorded. Thereafter, the winds shifted to grid north at 4 knots, increasing to 12 to 15 knots by the time the temperature reached -100° F. -- JFS

SIP 22485

551.521.14(74)

Hanson, Kirby J. and Herbert J. Viebrock

**ALBEDO MEASUREMENTS OVER THE NORTH-EASTERN UNITED STATES.** Monthly Weather Rev. 92(5):223-234 incl. illus., tables, graphs, diagrs., May 1964. 8 refs.

DLC, QC983.A2

On Sept. 16, 1961, a flight was made in a U.S. Navy P2V-7 aircraft to test a high-level albedo-measuring technique for use in the Antarctic. Eppley pyranometers mounted in the aircraft were used to measure the incoming and outgoing solar radiation fluxes at 7500, 9500 and 25,000 ft along flight paths between Atlantic City, New Jersey, and Erie, Pennsylvania. Albedo values were determined from this information for the flight level. Simultaneous photographs and radiation values were obtained on the 25,000-ft flight. The albedo for the high-level flight varied from 0.158 for no undercast to 0.538 for a complete altocumulus undercast. Two selected observations at 1722 GMT and 1737 GMT are further discussed. A solar radiation budget is prepared for the 1737 GMT measurement using the high-level flight data and ground data from Thornthwaite Laboratories near Elmer, New Jersey. (Authors' abstract, modified)

# CRRRL BIBLIOGRAPHY

SIP 22486 551.510.535:551.511(\*762)

Bullen, J. M.  
**IONOSPHERIC RECOMBINATION AND THE POLAR STRATOSPHERIC WARMING.** J. Atmos. Terrest. Phys. 26(5):559-568 incl. illus., tables, graphs, May 1964. 8 refs.  
 DLC, QC801.J6

An abrupt increase in noon values of  $\beta$ , the linear coefficient of recombination at the maximum of production of the ionospheric F-layer, occurred at Hallett Station, Antarctica, on Oct. 23, 1958. This sudden change, which was followed by a generally higher level of  $\beta$  during the summer, is distinct from the normal magnetic disturbance effect. The event was simultaneous with the onset of the explosive phase of the polar stratospheric warming in Antarctica and the beginning of the movement of the cold polar vortex off the continent. The evidence supports King's theory that there is a change in meridional circulation at high atmospheric levels when the polar vortex begins to move and is replaced by a summer-time high pressure system. Gas welling up in this system could increase molecular concentration at F-region levels and this would result in an increase in  $\beta$ , which is a measure of molecular/atomic ratio at these heights. A similar abrupt increase in  $\beta$ , observed between Oct. 9-12, 1957, confirms the conclusions from the 1958 data. A second sharp increase in  $\beta$  on Nov. 7, 1957, and Nov. 26, 1958, appears to be associated with the final movement of the polar vortex off Antarctica when the last change in meridional circulation to a stable summer-time pattern probably occurs. (Author's abstract, modified)

SIP 22487 551.521.2:551.510.4(\*3)

Vowinkel, F.  
**THE GREENHOUSE EFFECT OF THE ATMOSPHERE.** Scientific Rept. No. 11 under Contract No. AF 19(604)-7415, Publ. in Meteorology No. 67, Arctic Meteorology Res. Group, McGill Univ., 13p. incl. tables, graphs, July 1964. 4 refs.  
 DLC, Tech. Rept. Collection

The atmosphere is nearly transparent for solar radiation but most of the terrestrial radiation is trapped by water vapor, carbon dioxide, and clouds. Some of this absorbed heat is radiated back to the earth's surface. This process is generally called the "greenhouse effect" of the atmosphere. An expression is given for this effect and an equation is given for determining how much long-wave radiation from the ground is caused by non-radiative processes. The effect of water vapor in trapping terrestrial radiation is the dominating influence on the direct loss of heat by radiation from ground to space under cloudless conditions. Water vapor alone can trap 3.4 of the terrestrial radiation. With clouds, in the summer over the Central Polar Ocean, only 3% of the terrestrial radiation escapes through the atmosphere. The atmospheric greenhouse effect is remarkably stable in all latitudes and climatic zones. This is

due to the high moisture content of the atmosphere. Also, the greater cloud cover in high latitudes compensates for the smaller moisture content. (Author's abstract, modified)

SIP 22488 551.321:546.212.02:536.422/.423

Matsuo, Sadao, Hideko Kunivoshi, and Yasuo Miyake  
**VAPOR PRESSURE OF ICE CONTAINING D<sub>2</sub>O.** Science, 145(3639):1454-1455 incl. tables, graph, Sept. 1964. 6 refs.  
 DLC, Q1.S35

The vapor pressures of solid D<sub>2</sub>O and ice containing D<sub>2</sub>O in various amounts were measured with an oil manometer. The result gives the lowest vapor pressure for D<sub>2</sub>O ice ever obtained. The observed value for ice with different proportions of D<sub>2</sub>O and H<sub>2</sub>O agreed well with the values calculated on the assumption that the vapor pressure of HDO is the geometrical mean of those of H<sub>2</sub>O and D<sub>2</sub>O and that the equilibrium constant of isotopic exchange is 4. The fractionation factor of D between ice and vapor phase increases from 1.128 at 0°C to 1.210 at -38°C. (Authors' abstract)

SIP 22489 551.578.4(52)

Ishihara, Kenji  
**ON THE HEAVY SNOW IN JAN. 1963.** (Shōwa 38 nen 1 gatsu gōsetsu ni tsuite; Text in Japanese). Seppyō, 25(5):1-7 incl. tables, graphs, maps, Sept. 1963.  
 DLC, Orientalia Div.

The snow (which was 3-4 m deep) in Jan. 1963 in the Hokuriku District was part of a heavy-snowfall event. Maps are presented which show the areas of deepest snow concentration, and the number of days with snowfall above 20, 30, and 50 cm/day are graphed. Snowfall data are presented from 1912 to 1963. Also given are the atmospheric pressure distribution in Japan on the day of the heavy snowfall in Jan. 1963, and the distribution of snow and low temperatures in the mountains and the lowlands. -- CST/BLE

SIP 22490 551.578.4(52)

Takahashi, Koichiro  
**THE HEAVY SNOW IN JAN. 1963 IN RELATION TO WEATHER CHANGES OVER A LONG PERIOD.** (Kikō no chōki hendō kara mita shōwa 38 nen 1 gatsu no gōsetsu; Text in Japanese). Seppyō, 25(5):8-10 incl. table, graphs, Sept. 1963.  
 DLC, Orientalia Div.

Snowfall and temperature variations in the month of Jan. were traced from 1800 to 1963. The average snow accumulation is 64 cm while that in 1963 was

# CRREL BIBLIOGRAPHY

181 cm. The existence of a 9-yr heavy snowfall cycle was suggested but not confirmed. A parallelism was shown between the curves of heavy-snowfall days and sun-spot activity since 1500 averaged for 10-yr periods. -- CST/BLE

SIP 22491

624.144.53:625.1(52)

Hikita, Seiroku  
HISTORY OF SNOW DAMAGE CONTROL OF THE JAPANESE NATIONAL RAILWAY. (Kokutetsu ni okeru setsugai taisaku kenkyu no hensen; Text in Japanese). Seppyo, 25(3):22-26 incl. illus., table, Sept. 1963. 10 refs.  
DLC, Orientalia Div.

The history of snow damage control by the Japanese National Railway from 1880 to the present is summarized. Changes in avalanche and snow-storm control, methods and tools of snow removal, forecasting, helicopter patrolling, and the strengthening of power lines are reviewed. -- CST

SIP 22492

624.182(52)

Hikita, Seiroku  
APPLICATION OF AERIAL PHOTOGRAPHY TO AVALANCHE CONTROL BY THE JAPANESE NATIONAL RAILWAY. (Kokutetsu no nadare taisaku ni koku shashin no riyō; Text in Japanese). Seppyo, 25(5):31, Sept. 1963.  
DLC, Orientalia Div.

In an effort to ensure safe railway operation on the Joshinetsu and Hokuriku lines after heavy snows, avalanches were patrolled by helicopters from which aerial photographs were made. Thirty seven sections (a total distance of 1000 km) were covered. The photographs were of the scale of 1/10, 100-1/20,000 with a 60% overlap. Pictures of particularly dangerous places were enlarged. Further study is needed for effective application. -- CST/BLE

SIP 22493

551.578.48(52)

Forestry Experiment Station  
AVALANCHE INVESTIGATIONS IN THE NIIGATA AND FUKUI PREFECTURES. (Niigata fukui kenka ni okeru nadare ji chōsa; Text in Japanese). Seppyo, 25(5):32-38 incl. illus., tables, graphs, diagrs., Sept. 1963.  
DLC, Orientalia Div.

Avalanche investigations were made in Feb. and March 1963 along roads in the Niigata and Fukui Prefectures when the maximum snow accumulation was 2 to 4.6 m. The slope inclination of most avalanches was 40 to 50°. Eighty to ninety percent of them occurred in shrubby areas. The avalanches occurred

in all directions except the north and northwest. The diameter of the avalanche sources was 20 to 50 m. Average falling distance was 100 m although the greatest distance was over 1000 m. The avalanche-prevention step in the area was 1-3 m wide. Avalanches occurred only in places where the step width was less than 1.5 m. -- CST/BLE

SIP 22494

624.144.2:612.315.316(52)

Nagasaka, S.  
DAMAGES TO ELECTRIC POWER FACILITIES DURING THE HEAVY SNOW OF LAST WINTER. (Kontō no gōsetsu ni yoru denryoku setsubi no higai jōkyō; Text in Japanese). Seppyo, 25(5):39-46 incl. illus., tables, graphs, diagrs., Sept. 1963.  
DLC, Orientalia Div.

Statistics are given for snow-caused damages to electric facilities, such as washout, service-line interruptions, breakage of stay-wire supports, and transformer wreckage. The number of damages last winter to distribution and transmission lines was 5, 4 and 3 times greater respectively than in previous years. Snow-accumulation data for Jan. and Feb. are given for 5 places in Toyama, Fukui, and Ishikawa Prefectures. The maximum accumulation was 530 cm. Most damage, however, was caused when the snow was hard (density = 0.3-0.7 g/cm<sup>3</sup>) and the accumulation was less than 65 mm. Counter-measures and the use of vinyl-coated wire for service lines and wider spacing between the lines are discussed. -- CST/BLE

SIP 22495

551.510.6:550.37:621.396.07(\*7)

Swarm, H. M., D. K. Reynolds and A. W. Biggs  
ANALYTICAL STUDY OF ELF AND VLF RADIATION FIELDS FROM A HORIZONTAL DIPOLE IN ANTARCTICA. Tech. Rept. No. 87, Univ. of Washington, Coll. of Eng., Dept. of Elec. Eng., 67p. incl. graphs, diagrs., Jan. 1964. 100 refs.  
DLC, Tech. Rept. Collection

The purpose of this study is to predict the feasibility of an ELF-VLF system using a horizontal electric dipole antenna in Antarctica. The antenna would be located near Byrd Station or near Eight Station. A horizontal dipole is preferred over a vertical dipole because (1) no high towers or radial ground wires are required, and (2) the efficiency of a horizontal dipole increases with decreasing ground conductivity; the ground (ice) in Antarctica is assumed to be extremely low in electrical conductivity. The study comprises four major sections, each of which is concerned with an analytical model based upon radio-propagation parameters or characteristics of the system. The sections are: (1) radiation fields from an electric dipole in a semi-infinite anisotropic conducting medium, (2) ground-wave propagation over an inhomogeneous earth from an electric dipole, (3) radiation fields in the ionosphere from an electric

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dipole in the earth, and (4) performance prediction of the ELF-VLF system in the presence of an anisotropic earth and ionosphere and of an inhomogeneous earth. Results of the analytical solutions of the major subjects and an extensive literature search are presented. -- JFS

SIP 22496

628,336:542,463,3

Noda, Soroku and others  
EXPERIMENTAL STUDIES ON DEWATERING OF DIGESTED SLUDGE BY FREEZING, THAWING, AND FILTRATION METHOD. (Toketsu yukai o riyō shita odoi shori no kenkyū; Text in Japanese with English abstract). Eisei Kogaku (J. Dept. Sanitary Eng., Hokkaido Univ.), No. 9:41-53 incl. tables, graphs, diagr., Jan. 1964. 4 refs.  
DLC, Orientalia Div.

Experiments were performed with Buchner funnels to determine suitable freezing conditions, and the effects were studied of freezing temperature and time, freezing and thawing cycles, and standing time after thawing on the infiltrability of digested sludges. Carman's specific resistance is reasonable as an index in ordinary vacuum filtration but it is not applicable for sludges conditioned by freezing and thawing. A substitute index is discussed. A higher freezing temperature and longer freezing time increase filtrability, while thawing temperature has little effect on it. An increase in standing time lessens filtrability. The addition of proper chemicals to the sludge before freezing greatly improves filtrability. (Authors' abstract, modified)

SIP 22497

581,036

Saka  
SURVIVAL OF PLANTS AT SUPER-LOW TEMPERATURES. III. THE RELATION BETWEEN THE GRADE OF FROST HARDINESS AND THE EFFECTIVE PRE-FREEZING TEMPERATURE. Telson-kagaku (Low Temp. Sci.), Ser. B, No. 21:1-16 incl. illus., tables, 1963. 24 refs.  
DLC, Orientalia Div.

Twigs 10 cm long and 0.5 cm in diameter were pre-frozen from -5° to -70° C and then immersed in liquid nitrogen; the cooling rate of the twigs after prefreezing at -30° C was about 22° C/sec. After 30 min, they were transferred to air at -10° C for 4 hr and then to 0° C for 16 hr. After thawing, the twigs were placed in water at room temperature or planted in moist sand in a greenhouse to test the capacity of their development. The effective prefreezing temperatures in various plants are given. In general, the greater the frost hardness, the higher the effective prefreezing temperature. This temperature can be used as a reliable index of frost hardness of the hardy plants, such as willow, poplar, and white birch. The degree of frost hardness in these plants cannot be determined by the usual method because their twigs,

which can withstand freezing at -30° C, are not injured even when exposed to extremely low temperatures. In the twigs of such woody plants as alpine rose, crab apple, and black elder, the xylem and pith can survive freezing at -30° C without any damage for at least two days but not below -40° C, although their buds survive temperatures as low as -70° C. The mechanism of frost injury below -40° C in these tissues is not yet clear. (Author's abstract, modified)

SIP 22498

581,036

Sakai, Akira and Jitsuo Wada  
TEMPERATURE VARIATION IN OVERWINTERING TREES. Telson-kagaku (Low Temp. Sci.), Ser. B, No. 21:25-40 incl. illus., tables, graphs, 1963. 13 refs.  
DLC, Orientalia Div.

Frost damage in overwintering trees was investigated by measuring internal temperature fluctuation of the trunks with copper-constantan thermocouples. The greater part of the trunk of large trees (even large elms 86 cm in diam.) over-winter in the frozen state. In the trunk of kolonax, 13.5 cm in diam., the bark temperature on the south side, which is exposed to direct sunlight, reaches 20° C about midday in winter, while the north side remains almost unchanged and about the same as the environment (0.5° C). This trend was also found in other trees. However, white-birch bark, under similar conditions, is rarely warmed to a temperature higher than that of the environment. The temperature in small twigs, slender stems, and small leaves are only slightly affected by direct sunlight. Bark temperature is considerably affected by factors such as sunlight intensity, environmental temperature, trunk diameter, and bark-surface color. In the bark of trunks and twigs, the cortical cells on the south side are less susceptible to deep freezing than those on the north side. (Authors' abstract, modified)

SIP 22499

551,326,7:551,321,6(\*3)

Bilello, Michael A.  
ICE THICKNESS OBSERVATIONS IN THE NORTH AMERICAN ARCTIC AND SUBARCTIC FOR 1958-59, 1959-60. Special Rept. 43, U. S. Army Cold Regions Research and Engineering Laboratory, 43p, incl. tables, maps, July 1961. 1 ref.  
CRRRL files

In the spring of 1956, the author introduced SIPRE's 1-in. ice thickness kit to a network of Joint Arctic Weather Stations in Canada. By May 1960, the network was expanded to 30 well distributed locations throughout Canada. Ice-thickness measurements were made once a week in bodies of water close to the meteorological stations. Snow depth in the immediate area was also recorded and the program included instructions for reporting certain ice conditions such as surface character, number and extent

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of cracks, leads, and dates of freeze and break up. The elevation of each station and the observation periods are tabulated, and the locations are plotted on a map. At least 5 yr of data are needed before representative monthly maps can be drawn which show the effect of weather upon ice growth. Isolines of maximum observed ice thicknesses for each year and ice-thickness maps are given. The data tabulated include the date of observation, ice thickness, snow depth, and remarks. -- BLE

SIP 22500 551.326.7:551.321.6(\*3)

Bilello, Michael A.  
ICE THICKNESS OBSERVATIONS IN THE NORTH AMERICAN ARCTIC AND SUBARCTIC FOR 1960-61, 1961-62. Special Rept. 43, Part II, U. S. Army Cold Regions Research and Engineering Laboratory, 87p. incl. illus., tables, diagrs., maps, appendixes A-B, Feb. 1964. 6 refs.  
CRREL files

The first report in this series describes the initiation and expansion of the ice thickness measurement network in Canada. This report is a continuation of the current observational program and presents data on ice thickness during the 1960-61 and 1961-62 seasons. The network was expanded to Alaska during this period and some station changes have taken place. The observations were made once a week in bodies of water close to the meteorological stations. Written descriptions and the actual location of each site are given in the ice thickness tabulation when provided by the observer. Analysis is limited to a study of maximum ice thicknesses, and a list of participating stations is given. It is pointed out that open water or thin ice can occur at the time of maximum thickness. Phenomena which contribute to ice thickness include snow (which changes to snow-ice soon after freeze-over and again in late winter or early spring) and rafting. -- BLE

SIP 22501 551.343.625.7(52)

Muraki, Y. and H. Inami  
THE STUDY OF FROST HEAVE ON ROADS BY THE RI METHOD. MEASUREMENT OF WATER-CONTENT DISTRIBUTION IN FROST HEAVE TEST ROADS BY A NEUTRON MOISTURE METER. (RI no dōrō tōjō kenkyū eno riyō. Chūseishi suibunkai niyori tōjō shiken dōrō no gansuiryō bunpu sokutei. Text in Japanese). Hokkaidō Kaihatsukyoku Doboku Shūkenjo Geppō (Monthly Rept., Civil Eng. Experiment Station, Hokkaidō Development Bureau), No. 123:1-8 incl. illus., table, graphs, Sept. 1963. 2 refs.  
DLC, Orientalia Div.

The water-content distribution in frost-heave test roads and the effect of frost-heave suppression materials were studied by using a neutron moisture meter. The test road (located at Tomakomai, Toyama) was 480 m long and 7.5 m wide. It consisted of a 5-cm

surface layer, a 5-cm asphalt layer, a 20-cm sub-grade layer, a 15- to 45-cm frost-heave suppression layer, and a 55- to 85-cm layer of tiller soil. The moisture meter was the Hitachi insertion type with a BF<sub>3</sub> tube, a detection probe, and a transistor counter. Measurements were made at depths from 40 cm to 1.9 m. Gravel, sand, and volcanic ash were the frost-heave suppression materials. The following relations are discussed and graphed: (1) the vertical distribution of the water content and the underground water level, (2) water content and the thickness of the frost-heave suppression layer, (3) water content and time, and (4) frost heave and water content.  
-- CST/BLE

SIP 22502 551.579.2(52)

Nakata, Tetsurō and Masaru Danno  
ELEMENTARY STUDY ON ORIGINS OF DECREASE OF SNOW COVER. (Yūsetsuin no kisoteki kenkyū; Text in Japanese with English abstract). Nōgyō Doboku Kenkyū (J. Agricultural Eng. Soc. Japan), 31(8):457-462 incl. tables, graphs, May 1964.  
DLC, Orientalia Div.

Measurements were made of the effect of solar radiation and wind on the decrease of snow-cover depth, and the relationship was studied between the melt-water volume and the natural decrease in depth. The methods and equipment used are described. Snow-cover decrease by solar radiation (a) is related to the daily mean air temperature ( $\bar{t}$ ) by  $a = \alpha_0 - \alpha_2 \bar{t}$ , where  $\alpha_0$  and  $\alpha_2$  are constants. The decrease by wind, however, is not linearly related to temperature. Energy conservation of the atmosphere is considered in relation to solar-radiation absorption, heat transfer at the snow surface, and heat storage in the atmosphere. An expression is given for determining the daily natural decrease of snow cover which is based only on the daily mean temperature. Melt water was measured with an air duct. Density estimated from the melt-water volume was considerably different from true density, although the averaged values are correlative. (Authors' abstract, modified)

SIP 22503 551.326.7:551.321.6

Bogorodskii, V. V.  
MODERN PHYSICAL METHODS OF MEASURING THE THICKNESS OF SEA ICE. (Sovremennyye fizicheskie sposoby izmereniya tolschiny morskikh l'dov; Text in Russian). Okeanografiya, 3(4):720-730 incl. graphs, diagrs., 1963. 6 refs. (Eng. transl.: Directorate of Scientific Information Service, Defence Res. Board, Can., T 410 R, Oct. 1964)  
DLC, GC1.A47A23

Close-contact and remote methods of ice-thickness measurement are discussed. The close-contact methods include the capacitance method which is based on the difference of dielectric permittivity in



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... method based on ... reflected from ... media having different acoustic ... (where  $\rho$  is the density of the medium and  $v$  is the speed of sound in it), and the electromagnetic dipole method which is based on the phenomenon that sea ice and the underlying sea water have different electrical conductivities. The remote methods comprise the seismic-acoustic method and the electromagnetic remote methods. Emphasis is placed on: (1) electromagnetic properties and structure of sea ice, (2) reflection of electromagnetic waves from a plane layer at normal incidence, (3) constant- and variable-frequency electromagnetic methods, and (4) the choice of working frequency and the experimental testing of electromagnetic methods (the most promising of present methods of measuring ice thickness). -- BLE

SIP 22504 551,322,548,5:551,463,6

Kawasaki, S., H. Komizu and T. Uchida  
CRYSTALLIZATION OF ICE CRYSTALS IN SEA WATER. I. EFFECT OF INITIAL SUPERCOOLING DEGREE AND ROTATIONAL SPEED OF STIRRER. (Kaisuichū ni shōshutsu suru hyōkesshō. I. Shoki kareikyakudo no kakimaze sokudo no eikyō; Text in Japanese with English abstract). Kōgyō Kagaku Zasshi (J. Chem. Soc. Japan), 57(6):855-859 incl. illus., tables, graphs, June 1964. 12 refs.  
DLC, Orientalia Div.

The relationship between the crystallization rate of ice and the supercooling degree of sea water at a stirring speed of 500 rpm was determined. The relationship was not strongly affected by the initial supercooling degree, but it was greatly affected by stirring speed. The crystallization rate was controlled mainly by the formation of ice crystal nuclei and the growth of the a-axis surface of crystals in the supercooling range of 0.4° to 1.0° C. The formation of ice crystals in agitated sea water is controlled by the ice-water interface temperature. (Authors' abstract, modified)

SIP 22505 551,578,4:551,510,721

Osawa, Toshiyuki, Toshiyuki Yokota, and Kunitugu Maita  
THE NATURAL CONCENTRATION OF THE RADIOACTIVE MATERIALS IN FALLEN SNOW. II. (Sekisetsuchū no hōshasei busshitsu no shizen nōshuku; Text in Japanese with English abstract). Yamagata Daigaku Kiyō (Bull. Yamagata Univ.), 6 (1):35-42 incl. table, graphs, Dec. 1963. 4 refs.  
DLC, Orientalia Div.

The natural concentration of radioactive materials in fallen snow was investigated for the period 1961-1963. A definite relationship was detected between the amount of snow melted and the increase of radioactive materials in 1 kg of snow. The relative coefficient

of both quantities was 0.727. The concentration was greatest at the snow surface. In 1961 radioactive materials measured 15 cpm/kg of snow. In the last snowfall season (1963) the radioactive materials measured 2000 cpm/kg of snow. The materials were determined to be radioactive Zr and Nb by means of gamma scintillation spectroscopy. (Authors' abstract, modified)

SIP 22506 551,322,548,51

Papée, Henry M., Alberto C. Montefrude and T. W. Zawadzki  
ICE NUCLEATION AND GROWTH IN SUPERCOOLED WATER FILMS CONDENSED ON A HYDROPHOBIC SURFACE. Nature, 203(4952):1343-1345 incl. illus., tables, graphs, Sept. 26, 1964. 20 refs.  
DLC, Q1.N2

Measurements were made of ice-nucleability and related lag-times of nucleation, using ice and silver iodide nuclei which were supported on smooth plates made of an anticorrosive aluminum alloy measuring 15 cm x 15 cm x 1 mm. The plates were made to adhere to a copper block, 25 cm x 30 cm in surface area, which was hollow and cooled inside to 0.2° C by a fast-flowing stream of "Antifreeze" which was thermo-controlled by means of a standard refrigeration unit. The development of an ice-spot on an "Aplezon"-coated aluminum plate from water which condensed there from laboratory air could be satisfactorily monitored from a suitable angle if the plate were properly illuminated. Freshly ground commercial iodide and ice (which condensed on the copper block) were used alternately under conditions of illumination for the "seeding" of the plates. The spread of icing after nucleation appears to be approximately linear with time. While the time lag in nucleation appeared to be nil in the case of freezing initiated with ice, the behavior of silver iodide is quite different. An effect was detected of ultra-violet radiation on the nucleating power of freshly ground and desiccated silver iodide, which indicates that the activity of a silver iodide crystal may first be enhanced by short-wave light, and later destroyed by photolysis. -- BLE

SIP 22507 551,345-621,359

Hoekstra, P. and E. Chamberlain  
SOIL SCIENCE. ELECTRO-OSMOSIS IN FROZEN SOIL. Nature, 203(4952):1406-1407 incl. table, Sept. 26, 1964. 7 refs.  
DLC, Q1.N2

The extent was measured to which water can be moved through the films of unfrozen water in a frozen soil. A rectangular slab of soil was frozen between two brass plates in a refrigerated room at -30° C. The frozen slabs of soil were cut to size and placed in "Lucite" cells (1 cm x 5 cm). Electrodes were frozen to the sides of the sample. A thermistor was

# CRREL BIBLIOGRAPHY

used to record the temperature, while an electrical potential gradient of 1 V/cm was applied across the frozen soil. Water was transported toward the cathode. The initial and final water contents (unfrozen water and ice) of two soils after electro-osmosis are tabulated. The results indicate that a considerable amount of water can be transported in frozen soil under an electric gradient. For unfrozen soils the migration of water under electrical and temperature gradients has been related. This relation is probably true for frozen soils. -- BLE

SIP 22508 551.326.1/.2(\*666)

Akagawa, M.  
SEA ICE OBSERVATIONS ALONG THE OKHOTSK COAST OF HOKKAIDO FROM JAN. TO APRIL 1962. I. SEA ICE CONDITIONS IN THE SEA OFF HOKKAIDO FROM DEC. 1961 TO APRIL 1962. (1962 nen 1-4 gatsu hokkaidō kaihyō hōkoku. (I). 1962 nen hokkaidō shūhen no kaihyō jōkyō; Text in Japanese with English abstract). Kishōchō Gijutsu Hōkoku (Tech. Rept. Japan Meteorol. Agency), No. 30:1-34 incl. tables, graph, maps, Feb. 1964. 8 refs. DLC, Orientalia Div.

Sea ice data are discussed which were obtained from aerial reconnaissance, weather stations, and patrol ships during the period Jan.-April 1962. Shore and pack ice in the coastal region were weaker than in previous years. Pack ice appeared first at the southern station but it was not dominant in the coastal region. Shore ice in the Okhotsk Sea was thinner than in 1961, and pack-ice thawing time was poor in the central and northern areas of the Okhotsk Sea, the vicinity of the Kuril Islands, and west of the Kamchatka Peninsula. The above mentioned ice conditions were caused by a weaker monsoon-type pressure pattern and higher air temperature than normal. (Author's abstract, modified)

SIP 22509 551.326.1/.2(\*666)

Masuzawa, N.  
SEA ICE OBSERVATIONS ALONG THE OKHOTSK COAST OF HOKKAIDO FROM JAN. TO APRIL 1962. II. SEA ICE CONDITIONS OF THE OKHOTSK SEA BASED ON THE BROADCASTING OF U.S.S.R. BROADCASTS. (1962 nen 1-4 gatsu hokkaidō kaihyō hōkoku. (II). Soren no kaihyō jikkōhō niyoru ohōtsukukai no kaihyō hōkoku; Text in Japanese with English abstract). Kishōchō Gijutsu Hōkoku (Tech. Rept. Japan Meteorol. Agency), No. 30:35-49 incl. tables, graphs, maps, Feb. 1964. 2 refs. DLC, Orientalia Div.

This report discusses the sea ice conditions in the Okhotsk Sea based on data from the coast of Sakhalin, the Kuril Islands, the Kamchatka Peninsula, and the northern part of the Okhotsk Sea during the period from Nov. 1961 to April 1962. During this period

the sea ice appeared later and developed less because of higher temperatures. Pack ice has a great influence on the ice conditions in this area. (Author's abstract, modified)

SIP 22510 551.326.1/.2(\*66:52)

Akagawa, M.  
ON THE DRIFTING OF PACK-ICE IN THE PACIFIC OCEAN OFF HOKKAIDO. (Hokkaidō Taiheiyōgawa no ryūhyō no hyōryū ni tsuite; Text in Japanese with English abstract). Kishōchō Gijutsu Hōkoku (Tech. Rept. Japan Meteorol. Agency), No. 30:50-65 incl. illus., tables, maps, Feb. 1964. 2 refs. DLC, Orientalia Div.

The conditions, mechanism, and causative meteorological factors affecting pack ice in the Okhotsk Sea and the sea southeast of Hokkaido are discussed. No correlation was found between the appearance and disappearance of ice in the two areas. Easterly and southerly cyclonic winds break up the pack ice on the coasts of Kushiro, Tokachi, and Hidaka Districts. When pack ice is prevalent in waters southeast of Hokkaido, the appearance and disappearance dates of the ice are earlier than usual and the pack ice concentration is smaller. Peak concentration appears in Feb. Pressure patterns are the major factor influencing pack-ice conditions. (Author's abstract, modified)

SIP 22511 551.326.02(52)

Miura, S. and N. Masuzawa  
METHODS OF MEASURING DRIFT-ICE AND SEA-CURRENT VELOCITY. (Ryūhyō no hyōryū oyobi kairyū no sokutei ni tsuite; Text in Japanese with English abstract). Kishōchō Gijutsu Hōkoku (Tech. Rept. Japan Meteorol. Agency), No. 30:66-71 incl. tables, diagrs., Feb. 1964. 12 refs. DLC, Orientalia Div.

In 1961, sea-ice velocity was measured from a helicopter in 2 inland waterways and in the waters off Mombetsu. The wind-factor value (ice drifting velocity/wind velocity) obtained was 1/50. In 1962, the ice movement in the waters off Abashiri was measured by radio-wave reflection. No valuable results were obtained because of sea-ice reflection interference with projected radio-wave frequency. (Authors' abstract, modified)

SIP 22512 551.322:548.51

Fukuta, N.  
ICE NUCLEATION BY METALDEHYDE. Nature, 199(4892):475-476 incl. illus., table, Aug. 3, 1963. 7 refs. DLC, Q1.N2

# CIREL BIBLIOGRAPHY

Metaldehyde ( $\text{CH}_3\text{CHO}$ )<sub>4</sub> produced ice crystals at temperatures as high as  $-0.4^\circ\text{C}$ . Ice-nucleating ability depended on the method of preparation, dispersal, and particle size. A possible reason for its nucleating ability is suggested by its molecular and crystal structure. It has a pronounced prismatic cleavage due to its dipolar molecular structure. The resulting planes are parallel to the c-axis. For a tetragonal unit taken from the metaldehyde lattice, 3 possible orientations of ice were estimated to match in 3 directions of the unit,  $\{110\}$ ,  $\{110\}$ , and c-axis, with reasonable misfits. These three orientations appeared very often although others were seen. Epitaxial growth of ice on long needles of metaldehyde crystals at  $-15^\circ\text{C}$  is illustrated. A smooth prism plane gave few nucleation sites. Ice crystals were most frequently observed at the large steps and crushed parts. Although ice-formation by sublimation was easily seen at these temperatures, freezing of condensed water was predominant at higher temperatures. -- BLE

SIP 22513 624.21:624.145(\*50)

Tavrizov, V. M.  
PROTECTION OF BRIDGES FROM ICE BREAK-UP.  
(Zashchita mostov ot ledokhoda; Text in Russian).  
84p. incl. illus., tables, diagrs.; Moscow, 1964.  
17 refs.

DLC, Slavic unclassified

The pamphlet provides general information regarding ice break-up, and describes the methods used to ease the ice flow and to lessen the action of ice jam on bridges, ferry boats, barges, rafts, and wooden structures. The work to be done before and during the ice movement is discussed; the use of explosives during the operation is studied; and the safety measures to be taken before and during the blasts to protect the work. Structures are sketched. Information is provided for bridge and road foremen, as well as members of blasting crews participating in the organization of work, methods of procedure, and safety insurance. -- VDP

SIP 22514 551.324.28:551.324.5(\*729.5)

Limbirt, D. W. S.  
THE ABSOLUTE AND RELATIVE MOVEMENT, AND  
REGIME OF THE BRUNT ICE SHELF NEAR HALLEY  
BAY. Brit. Antarctic Survey Bull., No. 3:1-11 incl.  
tables, diagrs., maps, May 1964. 9 refs.

DLC, Unbound periodical

Grounded icebergs were used as sighting points, and the annual velocity of the ice shelf was determined as  $366 \pm 40 \text{ m/yr}$  in a direction  $266^\circ \pm 5^\circ$  east of true north for 1959. The principal horizontal strain was in a direction away from McDonald Ice Rumples which divert the flow of ice from WNW to W or even WSW. A kilometer stake pattern was used to determine strain rates in the surface of the ice shelf, which

were of the order of  $5 \times 10^{-4}$  per year. The mean annual vertical strain rate is approximately  $3 \times 10^{-4}$  which, together with the horizontal strains, indicates that bottom melting in the vicinity of Halley Bay is in near balance with the annual accumulation. The southwest ice front is possibly in equilibrium with the supply of ice. The probable flow pattern of the Brunt Ice Shelf is illustrated. -- GAD

SIP 22515 551.522.4:581.522.68(\*7)

Holdgate, M. W.  
AN EXPERIMENTAL INTRODUCTION OF PLANTS  
TO THE ANTARCTIC. Brit. Antarctic Survey Bull.,  
No. 3:13-16 incl. illus., table, May 1964. 4 refs.  
DLC, Unbound periodical

Several instances are cited of early experimental introduction of plants to the lower latitudes of the Antarctic. The information is compiled from unpublished records housed in the offices of the British Antarctic Survey. In 1944 an experimental plot was set up on Goudier Island at Port Lockroy using peaty soil from the Falkland Islands containing 9 species of vascular plants. Ecological conditions were not ideal, but the majority of species survived well during the summer of their introduction, four survived the ensuing winter, and only two were described as healthy during their second Antarctic summer. In Jan. 1950 none of the imported plants was found. Germination and early development also occurred in local soil for short durations. Similar experiments in the future would help reveal whether adverse ecological conditions or barriers to dispersal are responsible for the floristic barrenness of the Antarctic. -- GAD

SIP 22516 551.244.2:551.324.8(\*726.50)

Koerner, R. M.  
AN ICE CALDERA NEAR HOTTE BAY, TRINITY  
PENINSULA, GRAHAM LAND. Brit. Antarctic  
Survey Bull., No. 3:37-39 incl. illus., May 1964.  
6 refs.

DLC, Unbound periodical

An ice caldera formed on the seaward side of Nobby Nunatak in Nov. 1957. In July 1958 large quantities of meltwater drained into the caldera, and subsequently froze. More water accumulated until the feature disappeared in 1959, leaving a clear, bubble-free ice fringed by relict crevasses. An abundant supply of meltwater had probably enlarged an englacial or subglacial cavern so that collapse of the surface occurred. The occurrence of surface melt plugged the englacial drainage channels and caused the meltwater to collect as a surface lake. Subsequent re-freezing of the lake water leveled the surface depression completely so that another caldera can form only after new englacial or subglacial caverns have been formed. Ice calderas may be classified into a type where the subglacial or englacial caverns are formed by meltwater, and another type formed by volcanic heat. (See SIP 18123) -- GAD

# CRREL BIBLIOGRAPHY

SIP 22517 550.93:539, 16:551, 324, 83(234, 3)

Corbel, J. and E. le Roy Ladurie  
C14 DATING OF A MONT BLANC MORAINÉ. (Data-  
tion au C14 d'une moraine du Mont Blanc; Text in  
French). Rev. Géographie Alpine, 51(1):173-175,  
1963. 5 refs.  
DLC, DC611, A553R4

This is the first such dating carried out in the French Alps. Tree stumps were discovered beneath moraine at about 1700 m by the Tacou glacier, 5-1/2 km north of Mont Blanc. Two specimens of wood, examined in Berne, were dated to the years 1630 and 1680 A.D., suggesting a glacier advance in this period, comparable with the results recently obtained from similar evidence on the Aletsch glacier. Other correlations with Svartisen (Norway) and SE Alaska are briefly discussed. -- Geomorph. Abstracts

SIP 22518 551.324, 43:551, 58(234, 3)

Corbel, J.  
GLACIERS AND CLIMATES IN THE MONT-BLANC MASSIF. (Glaciers et climats dans le Massif du Mont-Blanc; Text in French). Rev. Géographie Alpine, 51(2):321-360 incl. diags., 1963. 42 refs.  
DLC, DC611, A553R4

This article reviews the climate of Mont-Blanc (emphasizing snow accumulation and recent fluctuations of climate), and the variations in size of the glaciers from 1962 back to the Würm maximum. Considering glaciological conditions and the results of pollen analysis, an attempt is made to reconstruct the former climatic conditions which gave rise to glacier advances and retreats. In pushing out toward the Pre-Alps, the glaciers encountered the climatically unfavourable zone of Chamonix. At 2000 m, the mean summer temperature falls from 9° (above Chamonix) to 5° C, and the annual snowfall increases from 8 m to 20 m. A moderate deterioration in climate would be sufficient to account for the main Würm advance. (Author's abstract, modified)

SIP 22519 551.322:537, 311

Cremers, Adrien and Henri Laudelout  
ELECTRIC CONDUCTIVITY OF ARGILLACEOUS ICE AS A FUNCTION OF TEMPERATURE. (Conductivité électrique des gels argileux en fonction de la température; Text in French). Compt. Rend. 259 (12):1975-1977 incl. graphs, Sept. 21, 1964. 3 refs.  
DLC, Q46, A14

Electrical conductivity measurements were made of water-clay electrolytes, in which the solid phase was less than 0.2  $\mu$ , between 20° and 45° C. The effect of temperature on the conductivity is expressed

by the parameter E of Arrhenius' equation  $K = K_0 \exp(-E/RT)$ , where K is the conductivity, R is the gas constant, T is the temperature, and  $K_0$  is an empirical constant. This law describes exactly the conductivity of ice as a function of temperature. The factors which affect this conductivity in argillaceous ice are the nature and concentration of the electrolyte with which the ice is saturated and the porosity of the clay. Data indicate that besides a decrease in the energy of activation with a decrease in the porosity of the ice, a minimum exists for the activation energy of conductivity in argillaceous ice in which only the surface contributes to current conduction. Such a minimum is not present in ice containing electrolytes. -- VDP/BLE

SIP 22520 551.593:551, 575, 1(\*49)

Kumal, Motol  
A STUDY OF ICE FOG AND ICE-FOG NUCLEI AT FAIRBANKS, ALASKA. PART I. Res. Rept. 150, U. S. Army Cold Regions Research and Engineering Laboratory, 27p. incl. illus., tables, graphs, diags., map, Aug. 1964. 22 refs.  
CRREL files

This study of arctic whiteout presents the results of condensation nuclei counts, identification of nuclei in ice fog, supercooled fog, and ice crystals, and the measurement of concentrations and liquid-water contents of ice-fog crystals. Ice fog occurred at temperatures of -37° C or lower only over the populated area of Fairbanks. The crystals formed at -40° C were predominantly spherical (2 to 15  $\mu$  in diam.), the remainder being hexagonal and columnar (5 to 30  $\mu$  diam.). It is suggested that spherical shapes were formed by the freezing of supercooled fog droplets, growing into hexagonal forms by sublimation of water vapor. Sintering of ice fog crystals was found even at a temperature of -40° C in ice fog. The grid residues of specimen crystals were examined with an electron microscope and diffraction method to investigate their nucleation. The nuclei substances and their sizes differed from those of snow crystals on the Greenland Ice Cap and were mainly commercial combustion by-products of 0.1 to 3  $\mu$  diameter. (Author's abstract)

SIP 22521 551.324, 84(\*38)

Langway, Chester C., Jr. and Ursula B. Marvin  
COMPARISON BETWEEN SNOW-IMBEDDED AND INDUSTRIAL BLACK SPHERULES. Res. Rept. 154, U. S. Army Cold Regions Research and Engineering Laboratory, 17p. incl. illus., tables, Oct. 1964. 28 refs.  
CRREL files

The chemical and physical properties of black spherules collected from shallow firn and deep ice layers on the Greenland ice sheet are compared with indus-

# CRREL BIBLIOGRAPHY

trial spherules (weld spatter). Morphologically both groups of spherules closely resemble each other. Electron probe microanalyses are compared with X-ray diffraction analyses on both groups of spherules. Chemically most of the Greenland spherules are Fe-rich with some Si and traces of Mn. Of the five varieties of industrial spherules examined, 4 contain Ni, some up to 50%, one variety contains no Ni and is chemically similar to the Greenland spherules. Density measurements show the Greenland spherules range between 4.2 and 5.9 g/cm<sup>3</sup> and that the industrial spherules studied range between 5.1 and 8.7 g/cm<sup>3</sup>. It is concluded that it is very difficult to establish the extraterrestrial nature of particles, at least the spherule-globule components, by morphological observations alone. The similarity of size frequency distributions suggests a similar extraterrestrial origin for the black spherules from both the 700-year-old ice and shallow snow layer samples, and may indicate that little or no spherical industrial contaminants are being deposited on the inland ice sheet. (Authors' abstract)

This report, which concerns the glaciology of Marie Byrd Land, is presented in three sections. The first section records the observations made along a 640-mi over-snow traverse from Little America to Byrd Station during Feb. 1957. Studies were made of snow density, grain size, type, temperature, and accumulation. The second section contains observations made during a wintering-over period in 1957 at Byrd Station. These studies consisted of measurements of snow accumulation, englacial temperature observations, sampling for tritium and oxygen isotope analysis, and the establishment of a surveyed stake system for the measurement of relative glacial movement. The final section contains data collected during a traverse to the north and east of Byrd Station. These studies are the same as those presented in section one of this report. This section also contains notes on englacial and firn quakes experienced by members of the traverse party, together with a summary of locations, elevations, and descriptions of geographic features observed along the traverse route. -- BLE

SIP 22522

551.1(\*49)

Heinsohn, Frank P., Philip L. Johnson and Ambrose O. Poulin  
ILLUSTRATED SUMMARY OF THE GEOLOGY OF THE YUKON FLATS REGION, ALASKA. Tech. Rept. 154, U. S. Army Cold Regions Research and Engineering Laboratory, 27p. incl. illus., map, Sept. 1964. 65 refs.  
CRREL files

The primary purpose of this report is to guide the reader to the area and to provide him with a guide to the available geologic literature. It is based on a review of the literature and a field reconnaissance of the region. The major landforms of Yukon flats are flood plains with many meander scars and oxbow lakes, terraces, alluvial fans, and sand dunes. Permafrost is discontinuous but in the poorly drained areas, other than lakes, it occurs to a considerable depth. Glacial drift and moraines, formed during the Pleistocene glaciation of the southern Brooks Range, occur as extensive deposits in the Chandalia River drainage system. Pleistocene valley glaciation is evidenced in the higher mountains of the Hodzana Highland and the Ray Mountains by cirques, hanging valleys, U-shaped valleys, and moraine and outwash deposits. The geologic history of the area is summarized. (Authors' abstract)

SIP 22523

551.32:551.506.2(\*772)

Anderson, V. H.  
USNC-IGY ANTARCTIC GLACIOLOGICAL DATA, FIELD WORK 1957 AND 1958. BYRD STATION. Proj. 825, Rept. No. 1, Pt. II, Ohio State Univ. Res. Foundation, 269p. incl. illus., tables, graphs, diags., maps, Dec. 1958.  
DLC, Tech. Rept. Collection

SIP 22524

551.32:551.506.2(\*747)

Cameron, Richard L., Olav H. Loken and John R. T. Molholm  
USNC-IGY ANTARCTIC GLACIOLOGICAL DATA, FIELD WORK 1957 AND 1958. WILKES STATION. Proj. 825, Rept. No. 1, Pt. III, Ohio State Univ. Res. Foundation, 173p. incl. illus., tables, graphs, diags., maps, graphs, Aug. 1959. 1 ref.  
DLC, Tech. Rept. Collection

The primary objective of this glaciological program was to determine the recession of the glaciers in the Byrd Coast area by studying accumulation, ablation, and movement. The area was studied. A study was also made of the glacier's history; chatter marks, crevasse marks, and other features were found. Samples of ice and rock were collected. From the data gathered in the Windmill Islands, the sequence of events is reconstructed from the time of maximum glaciation to the present. Evidence of higher sea levels in the Windmill Islands is presented, and movement studies were carried out on the Vanderford Glacier. -- BLE

SIP 22525

551.32:551.506.2(\*765)

Boyd, Walter W., Jr.  
USNC-IGY ANTARCTIC GLACIOLOGICAL DATA, FIELD WORK 1957 AND 1958. ROSS ICE SHELF TRAVERSE. Proj. 825, Rept. No. 1, Pt. IV, Ohio State Univ. Res. Foundation, 193p. incl. tables, diags., map, Jan. 1960.  
DLC, Tech. Rept. Collection

Ram-hardness and stratigraphic data are presented which were collected by the author on the Foas Ice

# CRRLE BIBLIOGRAPHY

Shelf Traverse of 1957-1958. In this report, each diagram represents a 3-m pit and the ramsonde and temperature scales have been altered from those ordinarily used. The stratigraphic data sheets give the dominant grain sizes of each stratum and the ratio of the relative abundance of the grain sizes. An analysis of the data presented in this volume will define the average snow accumulation on the Ross Ice Shelf. -- BLE

SIP 22526

551.32:551.506.2(\*72)

Neuburg, Hugo A. C.  
USNC-IGY ANTARCTIC GLACIOLOGICAL DATA.  
FIELD WORK 1958 AND 1959. 1958-1959 IGY AIRBORNE TRAVERSE. Proj. 825, Rept. No. 2, Pt. I, Ohio State Univ. Res. Foundation, 28p. incl. tables, diagrs., map, July 1959.  
DLC, Tech. Rept. Collection

The 1958-59 Airborne Traverse operated out of Byrd Station during Dec. 1958, with a Navy R4D-5 aircraft. The main studies were seismology and glaciology, supplemented by gravity meter data and surveys with an airborne magnetometer. Station positions, dates, elevations and air temperatures are summarized, and stratigraphic, and ram-hardness data are given together with a map of the traverse. -- BLE

SIP 22527

551.32:551.506.2(\*762:765)

DenHartog, Stephen L. and Charles R. Wilson  
USNC-IGY ANTARCTIC GLACIOLOGICAL DATA.  
FIELD WORK 1958 AND 1959. LITTLE AMERICA--VICTORIA LAND TRAVERSE MOVEMENT STUDIES. Proj. 825, Rept. No. 2, Pt. II, Ohio State Univ. Res. Foundation, 119p. incl. tables, diagrs., maps, July 1959.  
DLC, Tech. Rept. Collection

This is a report of the glaciological pit work carried out by Little America V personnel in 1958-59, and of ice-movement studies made on the Skelton Glacier and the Ross Ice Shelf west of Station 57 by the 1958-59 Victoria Land Traverse. At each main station a 3-m pit was dug unless the snow was too hard; temperature, density, and ramsonde measurements, and stratigraphic studies were made. To determine the absolute movement of the Skelton Glacier and the Ross Ice Shelf, mountain peaks were surveyed from both ends of one strain line at each station. A major profile was established at Station 61 on the Skelton Glacier, opposite Teall Island, where the glacier is floating. The methodology and results of the measurements are discussed. -- BLE

SIP 22528

551.32:551.506.2(\*727:772)

Goodwin, Robert J.  
USNC-IGY ANTARCTIC GLACIOLOGICAL DATA.  
FIELD WORK 1958 AND 1959. ELLSWORTH TRAVERSE 1958-59. Proj. 825, Rept. No. 2, Pt. III, Ohio State Univ. Res. Foundation, 80p. incl. tables, diagrs., map, Dec. 1959.  
DLC, Tech. Rept. Collection

Ablation, accumulation, firn-temperature, strain-pin-measurement, and sea-ice data are presented which were obtained at the Ellsworth IGY Station in 1958 and 1959. Ablation and accumulation measurements were made over a network of 57 stakes set out around Ellsworth Station. The six thermohms in the temperature-study plot were spaced at depths from 80 to 1600 cm. Strain pins were inserted on the walls of the 30-m deep pit dug in the winter of 1957 and along the walls, floor, and back of a 15-m longitudinal tunnel at the 10-m level dug in the winter of 1958. A log was kept of the sea ice in a small embayment 2 mi north of Ellsworth Station. -- BLE

SIP 22529

551.32:551.506.2(\*701)

Giovinetto, Mario B.  
USNC-IGY ANTARCTIC GLACIOLOGICAL DATA.  
FIELD WORK 1958 AND 1959. SOUTH POLE STATION. Proj. 825, Rept. No. 2, Pt. IV, Ohio State Univ. Res. Foundation, 104p. incl. tables, diagrs., April 1960. 16 refs.  
DLC, Tech. Rept. Collection

This report presents the pit-stratigraphy and stake-measurement data collected at Amundsen-Scott Station from Jan. 5 to Nov. 26, 1958, for studies of snow accumulation and firn-temperature observations. The preliminary considerations include weather, surface features, and 1957 glaciological observations. Oxygen-isotope ratios provided means of identifying annual accumulation layers where others failed. Periodic and seasonal snow-accumulation values were obtained with the aid of a network of 55 wooden dowels placed and leveled 250 m windward of the station. To measure deep firn temperature, horizontal holes were drilled 6 m in the west wall of the Snow Mine at depths of 12, 16, 20, and 24 m. -- BLE

SIP 22530

551.1:551.4:551.506.2(\*747)

Robertson, Richard  
USNC-IGY ANTARCTIC GLACIOLOGICAL DATA.  
FIELD WORK 1958 AND 1959. PRELIMINARY REPORT ON THE BEDROCK GEOLOGY OF THE WINDMILL ISLANDS. Proj. 825, Rept. No. 2, Pt. VI, Ohio State Univ. Res. Foundation, 25p. incl. illus., map, Sept. 1959. 5 refs.  
DLC, Tech. Rept. Collection

# CRREL BIBLIOGRAPHY

This report is based on field observations made during 1958 in the Windmill Islands, and on hand specimen identification of samples. The topography of the islands includes fluvial features, sparse vegetation, excellent rock exposures, and frost and crystal-growth wedging. Five broad groups of igneous and metamorphic rocks are present: migmatite (oldest), amphibolite dikes and pods, acidic to intermediate intrusives, foliated porphyritic granites, and diabase and gabbro dikes (youngest). Lithologic descriptions of individual areas are given, and geologic structures, structural development, geologic history, moraine lithology, and economic considerations are discussed. -- BLE

SIP 22531 552.1:551.4:551.506.2(\*772)

Anderson, V. H.  
USNC-IGY ANTARCTIC GLACIOLOGICAL DATA. FIELD WORK 1958-1959. THE PETROGRAPHY OF SOME ROCKS FROM MARIE BYRD LAND, ANTARCTICA. Proj. 825, Rept. No. 2, Pt. VIII, Ohio State Univ. Res. Foundation, 27p. incl. illus., tables, map, appendix I-II, Sept. 1960. 11 refs.  
DLC, Tech. Rept. Collection

Rock specimens from newly-discovered mountain masses and nunataks in Marie Byrd Land, Antarctica, are described. The volcanic specimens, identified as oligoclase andesite, reflect a marginal-continental occurrence, typical of the Circum-Pacific volcanoes. Petrographic, lithologic, and structural evidence suggest that the Sentinel Mountains structure can be extended for about 200 mi southwestward to Mt. Johns and Mt. Ewing. Detailed petrographic descriptions of 80 thin sections are presented. (Author's abstract)

SIP 22532 551.32:551.506.2(\*747)

Hollin, John T., Caspar Cronk and Richard Robertson  
USNC-IGY ANTARCTIC GLACIOLOGICAL DATA. FIELD WORK 1958. WILKES STATION GLACIOLOGY, 1958. Proj. 825, Rept. No. 2, Pt. X, Ohio State Univ. Res. Foundation, 255p. incl. illus., tables, graphs, diagrs., maps, Aug. 1961. 37 refs.  
DLC, Tech. Rept. Collection

The major part is presented of the glaciological data collected by the 1958 wintering-over party at Wilkes Station. The major sections of the report are entitled (1) topographic surveys, which includes a discussion of previous work and data from 1959; (2) movement surveys (observations of the Vanderford and Grinnell Glaciers); (3) gravity survey; (4) meteorological and oceanographical data (air temperature and sea ice observations); (5) glaciological observations on the surface (surface forms, stake measurements, etc.); and (6) glaciological observations below the surface (made in all three zones of the ice sheet: firn and superimposed ice accumulation, and ablation). The subsurface observations in-

clude wetness, hardness, density and the density of new snow, grain structure, "crusts," gas and dirt inclusions, crystallography, stratigraphy and dating, electrical conductivity, cracks, and ice temperatures.  
-- BLE

SIP 22533 551.32:551.506.2(\*772)

Long, W. E.  
USNC-IGY ANTARCTIC GLACIOLOGICAL DATA. FIELD WORK 1958 AND 1959. GLACIOLOGY, BYRD STATION AND MARIE BYRD LAND TRAVERSE, 1958-1959. Proj. 825, Rept. No. 2, Pt. XI, Ohio State Univ. Res. Foundation, [296p. incl. tables, diagrs., maps, Jan. 1961.  
DLC, Tech. Rept. Collection

The 1958-59 Marie Byrd Land Traverse covered 915 nautical miles in a roughly triangular route extending south of Byrd Station and passing along the Horlick Mountains on the second leg of the triangle. The traverse glaciology included pit studies and ten-meter-temperature and sastrugi-orientation measurements. The station glaciology included pit studies, firn temperature, snow accumulation, surface studies, measurements of deep nit deformation, and a relative movement survey. -- BLE

SIP 22534 551.32:551.506.2(\*762)

Stuart, Alfred W. and Arnold J. Heine  
EGC ANTARCTIC GLACIOLOGICAL DATA. FIELD WORK 1959-60. GLACIOLOGY, VICTORIA LAND TRAVERSE, 1959-60. Proj. 968, Rept. No. 1, Ohio State Univ. Res. Foundation, [106p. incl. illus., tables, graphs, diagrs., maps, appendixes I-II, Jan. 1961. 7 refs.  
DLC, Tech. Rept. Collection

The interpretation of 19 snow pits dug by the 1959-60 Victoria Land Traverse gives a mean annual accumulation of 16 cm of water equivalent for the area studied. Deposition is thought to occur in the form of sastrugi instead of in blanket form, which introduces a serious error in the interpretation. Approximate mean annual air temperatures ranged between -38.4°C and -47.4°C. A map of the traverse route shows contoured elevations and sastrugi observations. The highest elevation was 2591 m. A compilation of accumulation stakes emplaced by this traverse is made available. The Rennick Glacier which flows into Rennick Bay and extends southward for about 300 km was also studied; a sketch map is included. Accumulation stakes were measured on the Ross Ice Shelf, Skelton Glacier, and the Victoria Land Plateau near the coast of the Ross Sea. Annual values ranged from 23.5 to 1.7 cm of water equivalent; the higher accumulation is on the Ross Ice Shelf. (Author's abstract)

# CRREL BIBLIOGRAPHY

SIP 22535

551.332:551.506.2(\*772)

Pirrit, John and George A. Douman  
IGC ANTARCTIC GLACIOLOGICAL DATA. FIELD WORK 1959. GLACIOLOGY, BYRD STATION AND MARIE BYRD LAND TRAVERSE, 1959-1960. Proj. 968, Rept. No. 2, Ohio State Univ. Res. Foundation, [177]p. incl. tables, diagrs., maps, appendixes I-IV, Nov. 1960.

DLC, Tech. Rept. Collection

The results are presented of the glaciological program at Byrd Station during the winter of 1959 and the summer traverse of 1959-60. The station observations included snow accumulation and densities, firn temperatures, and deep-pit, relative-ice movement, and sastrug studies. A new triangulation network of 7 stakes was established in Oct. 1959, for relative movement studies. The traverse observations included pit studies at all major stations, and snow-accumulation, density, and firn-temperature measurements. Pit diagrams and stratigraphic data, ram-hardness and firn-density data, and Byrd Station firn temperatures are appended. -- BLE

SIP 22536

629.11:551.578.46:641.5:551.506.2 (\*762)

Heine, Arnold J.  
IGC ANTARCTIC GLACIOLOGICAL DATA. FIELD WORK 1959-60. SOME OPERATIONAL AND MECHANICAL ASPECTS OF THE 1959-60 VICTORIA LAND TRAVERSE. Proj. 968, Rept. No. 3, Ohio State Univ. Res. Foundation, 41p. incl. tables, diagrs., map, Jan. 1961.

DLC, Tech. Rept. Collection

Operational and mechanical aspects are discussed of the 1959-60 Victoria Land Traverse. Time and mileage are summarized, and data are given concerning air support, loads pulled by Snocats, fuel (consumption, fuel-line icing, etc.), and mechanical failures of Snocats. The sleds used on the traverse are described and recommendations are made to improve their performance. The traverse food is discussed in relation to the conditions which affect food consumption and its preparation. -- BLE

SIP 22537

656(\*7)

National Academy of Sciences--National Research Council  
SYMPOSIUM ON ANTARCTIC LOGISTICS. Washington, 778p. incl. illus., tables, graphs, diagrs., 1963.

DLC, Q180.A6S93

The symposium, held at Boulder, Colo., Aug. 13-17, 1962, was sponsored by the Committee on Polar Research of the National Academy of Sciences, under the auspices of the Scientific Committee on Antarctic Research

(SCAR) Working Group on Logistics of the International Council of Scientific Unions (ICSU). The papers presented at the symposium deal with science and logistics in general, air, sea and field operations, as well as buildings and provisioning. Experiences of all participating nations are discussed relative to the problems of providing buildings, food and clothing for polar environments, and recommendations are made for future operations. (See SIP 22538-22587)

-- GAD

SIP 22538

629.13.074(\*7)

528.715(\*775)

Margalot, Pedro F.  
THE ARGENTINE FLIGHT TO THE SOUTH POLE 1961-1962. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 35-39, 1963. 2 refs.

DLC, Q180.A6S93

The purpose was a visual and aerophotographic reconnaissance flight of the Western Route of the Weddell Sea and of the area south of Ellsworth and Belgrano stations so as to establish a new alternative route to those bases, and to increase the knowledge of the Argentine Antarctic sector. The operation was accomplished by two C-47's. Details are given of the preparations, maintenance, and flight route. The flight demonstrated that with limited materials and means, carefully organized and prepared, the carrying out of seemingly over-ambitious plans can be effected. -- GAD

SIP 22539

629.13.074(\*701)

Pittaluga, Jorge A.  
PERFORMANCE OF THE C-47 AIRCRAFT IN THE FLIGHT TO THE SOUTH POLE 1961-62. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 40-42, 1963.

DLC, Q180.A6S93

This paper describes the experience gained during this flight under abnormal conditions. Careful analysis was made to arrive at a balance of objective and risk. The results in take-offs, climbing, cruising, landing, taxiing and parking are given. It is concluded that the C-47's performance was very adequate, although the aircraft is restricted on long range flight by the increase of its take-off weight to an amount too great for the type. -- GAD



# CRRRL BIBLIOGRAPHY

SIP 22540

629, 13, 074(\*747)

Dalton, R. F. M.  
THE OPERATION OF BEAVER AIRCRAFT FOR ANT-  
ARCTIC OPERATIONS. In: Symposium on Antarctic  
Logistics (1962). Natl. Acad. Sci.-Natl. Res. Coun-  
cil, p. 46-59 incl. illus., tables, 1963.  
DLC, Q180, A6S93

Beaver aircraft on floats, skis and wheels have been  
successfully used by ANARE for Antarctic work since  
1956. This paper describes the performance of this  
type of aircraft as equipped by ANARE in its various  
configurations, and the work it has done in aerial  
photography, aerial reconnaissance and support for  
field parties. Some problems which have arisen are  
discussed, together with measures adopted to solve  
them. The Beaver contributed worthily and inexpen-  
sively to Antarctic aviation. With its true S.T.O. L.  
characteristics and rugged strength, and in spite of  
its production in 1949, it is still efficient as a light  
aircraft for short-range Antarctic operations. --  
GAD

SIP 22541

629, 139, 8(\*7)

Law, Phillip  
MOORING AIRCRAFT IN ANTARCTICA AGAINST  
STRONG WINDS. In: Symposium on Antarctic  
Logistics (1962). Natl. Acad. Sci.-Natl. Res.  
Council, p. 73-79 incl. diagrs., 1963.  
DLC, Q180, A6S93

The paper discusses the problems involved in anchor-  
ing aircraft safely on ice or névé, and suggests solu-  
tions for these problems. Considering wind direction  
and speed several drawings illustrate the techniques  
of safe anchoring, and a number of general precau-  
tions are listed. -- GAD

SIP 22542

629, 138, 4:623, 48(\*7)

Itoh, Noboru and Seiki Watanabe  
REPORT ON AIRCRAFT OPERATIONS, JAPANESE  
ANTARCTIC RESEARCH EXPEDITIONS. In: Sympo-  
sium on Antarctic Logistics (1962). Natl. Acad. Sci.-  
Natl. Res. Council, p. 80-85 incl. tables, 1963.  
DLC, Q180, A6S93

This report describes several types of aircraft for  
transportation, topographical survey, and other Ant-  
arctic activities. Reference is made to the mainte-  
nance problems and the meteorological conditions  
pertaining to these activities around Shwa Station.  
-- GAD

SIP 22543

629, 138

656, 7, 073(\*7)

Cranfield, W. J.  
THE OPERATION IN ANTARCTICA OF LIGHT AIR-  
CRAFT BY THE R.N.Z.A.F. In: Symposium on  
Antarctic Logistics (1962). Natl. Acad. Sci.-Natl.  
Res. Council, p. 86-98 incl. tables, 1963.  
DLC, Q180, A6S93

An Auster and a Beaver aircraft operated from Scott  
Station for ice pack reconnaissance, locating bases  
and routes for field parties, supplying land parties  
and depots, and performing oblique photography.  
Details are given of structural modifications, main-  
tenance, and other aspects of the operation. The  
Beaver proved to be ideal in its strength, reliability  
and economy; the Auster may have carried out its  
float-plane role satisfactorily but it has no place in  
Antarctic operations. -- GAD

SIP 22544

629, 135:527(\*7)

Arsenault, L. A.  
AIR NAVIGATION IN THE ANTARCTIC. In: Sym-  
posium on Antarctic Logistics (1962). Natl. Acad.  
Sci.-Natl. Res. Council, p. 99-101, 1963.  
DLC, Q180, A6S93

Antarctic air navigation depends on the USAF grid  
overlay and the N-1 gyro. Since the flights are con-  
ducted in 24 hr of daylight, the sun, driftmeter, and  
weather radar are the only aids for dead-reckoning.  
In spite of all the sophisticated navigation equipment  
anticipated in future aircraft, actual landing on the  
ice and compacted snow will be as hazardous as it  
was in 1929. -- GAD

SIP 22545

629, 135, 45(\*7)

Greene, John H.  
OPERATION OF TURBINE ENGINE HELICOPTERS  
IN THE ANTARCTIC. In: Symposium on Antarctic  
Logistics (1962). Natl. Acad. Sci.-Natl. Res. Coun-  
cil, p. 102-104, 1963.  
DLC, Q180, A6S93

Turbine powered helicopters require no preheating or  
auxiliary power units, can start in temperatures  
around -35°C, and become airborne within 2 min of  
starting time. The rotorcraft is capable of carrying  
a greater payload at higher average speeds and alti-  
tudes, and operate practically anywhere. The per-  
formance during project Topo-North, Topo-South,  
is discussed, together with the problems and limita-  
tions of the aircraft. The helicopter has a tremen-  
dous potential, and its capabilities are limited only  
by the imagination of its user. -- GAD

# CRREL BIBLIOGRAPHY

SIP 22546

629.139.1(\*7)  
624.147(\*7)

Moser, Earl H.

ICE AND SNOW RUNWAYS. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 105-120, incl. illus., diagr., 1963. 20 refs.

DLC, Q180.A6S93

This presentation highlights the results of Operation Deep Freeze work in ice engineering and snow compaction as related to runways in Antarctica, methods of strengthening sea ice, grading and leveling. Methods of improving snow runways, layered snow-compaction techniques, and construction applications are discussed. Knowledge of such variables as geographic location, the season of the year, temperature, and the type and condition of base materials, is essential for improving these techniques. It is planned to continue current work in snow-compaction at McMurdo, and expand this effort to Byrd Station. -- GAD

SIP 22547

656.7.073(\*7)

Greenwell, Martin D.

U. S. AIR OPERATIONS IN ANTARCTICA. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 121-137, 1963.

DLC, Q180.A6S93

Air operations as a means of providing transportation, reconnaissance, mapping and rescue services are discussed, and air operating techniques, problem areas and successes are described. Despite the rudimentary base facilities, the extreme climate and difficult conditions, skilled airmen can provide the required aviation services by applying the basic principles of aircraft operation and the adaptation of routine maintenance procedures. -- GAD

SIP 22548

69.033(\*7)

Giovannini, Alberto P.

HOUSE FOR EXTREME COLD ZONE. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 141-173, incl. illus., diagr., 1963.

DLC, Q180.A6S93

A type of house is described which has room for 20 men, with bedrooms, living room, dining room, radio room, bathroom, and kitchen. By altering its partitioning, the house furnishes workshop space, battery room, powerhouse, laboratories, etc. It is easily transported, can be erected in 60 hr, is simple to heat, completely windproof, and will support three meters of snow. It is well suited for erection on a compact snow surface, characteristic of Lassiter or Filchner shelf ice. (Author's abstract, modified)

SIP 22549

69(211)(\*7)

Styles, D. F. and others

AUSTRALIAN DESIGN AND CONSTRUCTION OF ANTARCTIC BUILDINGS. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 175-196 incl. illus., diagr., 1963.

DLC, Q180.A6S93

A. N. A. R. E. stations are based on rock, moraine, or sand, and are kept fairly clear of snow by the wind. Building techniques have been developed which provide easy and quick erection of very rigid, insulated and well sealed buildings on rough, unprepared ground. These techniques are described under the main headings of foundations, floors, panel construction and assembly, functional design, anchorage, heating and ventilation, maintenance, and preparation and packing of components. (Authors' abstract, modified)

SIP 22550

69.035(\*786)

Ballantyne, J. and J. Nisbet

A LIGHT-WEIGHT PORTABLE HUT FOR FIELD USE. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 197-201 incl. diagr., 1963.

DLC, Q180.A6S93

A small hut of simple construction is described. The design has proved highly successful for field stations used by A. N. A. R. E. biologists at Macquarie Island. With little modification it could be used effectively in Antarctica. (Authors' abstract)

SIP 22551

628.1:614.841.5(\*747)

Smith, G. D. P.

SEA WATER FOR FIRE-FIGHTING IN ANTARCTICA. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 206-209 incl. diagr., 1963.

DLC, Q180.A6S93

Difficulties in providing water complicate the problems of fire fighting in Antarctica. This paper describes a system, used at A. N. A. R. E. coastal stations, in which sea water is obtained from a hole in the sea ice and pumped by a portable motor pump to the site of the fire. This unit is not restricted to fire fighting. Daily hosing keeps the rock clean; when the melt-pools are open, fresh water is pumped for domestic use. -- GAD

# CARREL BIBLIOGRAPHY

SIP 22552

624.144.55:697.3(\*735)

Smith, F. A.  
AN ECONOMICAL SNOW-MELTING AND CENTRAL HEATING SYSTEM. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 210-214 incl. diagrs., 1963.  
DLC, Q180, A6S93

A snow melter is described which uses a closed circuit between a high efficiency oil-fired boiler and a jacketed storage tank. The circuit may be extended to provide a central heating system for Antarctic buildings. The unit operated successfully for several months including the coldest, and indications are such that, while it is simple, inexpensive and efficient, it can function with the minimum of attention. The closed hot water circulation in the boiler, and the copper jacketed tank ensure long economic life for the system. -- GAD

SIP 22553

685.532:551.578.4:678.5

Expéditions Polaires Françaises, Bureau Technique IGLOO (PLASTIC POLAR BUILDING). In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 215-237 incl. illus., diagrs., 1963.  
DLC, Q180, A6S93

Igloo is a dwelling, made of plastic, which was installed at the winter station of International Glaciological Expedition to Greenland in 1959. The results obtained proved that the building fulfilled such requirements as lightweight, quick assembly by a few men, and durability. It can be used wherever a station can be constructed under the névé surface, particularly if Charcot Station were to be replaced. -- GAD

SIP 22554

624.144.55:697.3(\*7)

Awano, Seiti and Sumio Maita  
COLD AND HOT WATER MAKING EQUIPMENT UTILIZING THE EXHAUST-GAS ENERGY OF DIESEL ENGINES COUPLED WITH ELECTRIC GENERATORS. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 254-280 incl. illus., tables, graphs, diagrs., 1963.  
DLC, Q180, A6S93

An economical ice-melting and hot-water making system was developed, in which the heat source was mainly dependent on the exhaust-gas heat energy of the water-cooled diesel engines coupled with 20-kw electric generators. The system supplied sufficient cold and hot water during the last several years with a saving of 50 fuel drums per yr. A recovery system for engine coolant heat was also devised and constructed but not used. The recovery of exhaust-gas

energy is safer, easier, and more effective than that of coolant heat energy. The parts and designs are illustrated, and specification data are tabulated. -- GAD

SIP 22555

69(211):69.033(\*7)

Hida, Naoto  
PROBLEMS IN ERECTION OF BUILDINGS IN THE ANTARCTIC REGION. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 281-284 incl. diagrs., 1963.  
DLC, Q180, A6S93

The paper consists of two short sections. The first section reviews some problems of weather and ground conditions, transportation, and types of buildings. The second describes the effective measures in design and construction which have proved successful in solving these problems. -- GAD

SIP 22556

699.81(\*7)

Ponder, W. Frank  
FIRE SECURITY IN DESIGN OF ANTARCTIC BUILDINGS. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 285-290, 1963.  
DLC, Q180, A6S93

Aspects of fire prevention include the siting of buildings, the selection of fire resistant materials, the introduction of devices to prevent fire spreading, and providing proper means of escape. Several items of importance are discussed concerning the fueling arrangements and warning devices, with a list of rules established at Scott Station. Part of the paper is devoted to fire-fighting equipment and techniques. -- GAD

SIP 22557

69.033

Pugh, L. G. C. E.  
PORTABLE PREFABRICATED LABORATORY. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 316-319 incl. illus., diagrs., 1963.  
DLC, Q180, A6S93

A prefabricated laboratory-hut, used in the Himalayas by Sir Edmund Hillary, incorporates design features fit for use in the polar regions. The cylindrical hut is 22 ft long, 10 ft in diameter, and weighs about 1 ton. It has 100 sections with insulated wall panels 4.5 in. thick, with accommodations for 8 bunks and laboratory space. It is designed for -40° C with a

# CRREL BIBLIOGRAPHY

kerosene consumption of 1-1/2 to 2 gallons a day. Electric power was supplied by a wind generator. Other features and specifications are discussed. -- GAD

SIP 22558 551.579.3(\*38)  
628.2(\*38)

Schmitt, Richard P. and Raul Rodriguez  
GLACIER WATER SUPPLY AND SEWAGE DISPOSAL SYSTEMS. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 329-338 incl. illus., table, diagrs., 1963. 1 ref. DLC, Q180.A6S93

Production of large quantities of water at semipermanent type installations has been inefficient in the use of fuel and manpower. An efficient sub-surface water system at Camp Century, Greenland, entails a vertical shaft into the ice with continuous introduction of heat. The surrounding ice melts, and the collected water is pumped from the pool to the surface as required. The drilling assembly and requirements are illustrated, with data on the statistics, efficiency, consumption, and costs. Through a water-borne sewage system all camp waste water flows by gravity to a central collecting tank where it is pumped automatically to a sub-surface waste disposal hole. Variations of these systems are feasible for producing lesser quantities of water, and disposal of less waste to suit particular installations. -- GAD

SIP 22559 656(\*746)

Soviet Commission on Antarctic Research  
TRANSPORTATION OF PREFABRICATED UNITS FOR BUILDINGS FOR SOVIET ANTARCTIC STATIONS. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 339-340, 1963.

DLC, Q180.A6S93

A total of 380 tons of prefabricated building materials were airlifted to Antarctica and disembarked at Mirnyy and the other Soviet stations. Ready-made houses, assembled and fully equipped, were delivered on 3-ton sleds towed in pairs by heavy-duty tractors. Some building material was landed and air-dropped to the inland stations, but the tractor-sled train was the main means of transportation. -- GAD

SIP 22560 551.579.3(\*746)

Soviet Commission on Antarctic Research  
WATER SUPPLY OF SOVIET ANTARCTIC STATIONS. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 341-342, 1963. DLC, Q180.A6S93

Three tubular electroheaters are inserted in a hole in the ice 500 m from Mirnyy Station to provide one ton of fresh water a day. The water in the hole does not freeze up to -30° C outdoor temperature, and is transported to the station in a sled-mounted, heated tank. A specially-heated wanigan has an assembly for ice sawing, and an electric pump for drawing water. When the water is exhausted the wanigan is towed to another site, and the electroheaters are mounted again. This operation is economical in manpower and time, and the water is free of pollution. The galley has a 25-m<sup>3</sup> cistern with electroheaters, installed in a snow trench; a pump pumps the water into the discharge tank of the galley. -- GAD

SIP 22561 624.148(\*746)

Soviet Commission on Antarctic Research  
BEHAVIOR OF BASIC MATERIALS AT LOW TEMPERATURES. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 352-354 incl. table, 1963. DLC, Q180.A6S93

Observations of the behavior of fuel, steel, rubber, etc., were made at Vostok Station where the lowest temperature recorded in 1958 was -87.4° C. At -52° C, B-70 gasoline did not catch fire from a burning match; at -60° C kerosene became snowy, then solid at -85° C; and at -60° C diesel could be cut with an axe. Anti-freeze did not freeze but turned into a dense paste. Adding anti-freeze to the ink of recorders at -80° C saved the ink from freezing. Steel boring tubes 4 mm thick broke after 5-8 blows of the back of an axe, welding broke at the first blow; and the bottom of a barrel shattered with 3 blows at -87.4° C. -- GAD

SIP 22562 69(211)(\*746)

Arctic and Antarctic Research Institute  
BUILDINGS AND INSTALLATIONS OF THE SOVIET ANTARCTIC EXPEDITION. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 355-360 incl. table, 1963. DLC, Q180.A6S93

The article discusses in detail the buildings, prefabricated material, and general layout at Mirnyy, Novolazarevskaya, and the inland stations. Areas, shapes, and pertinent specifications are listed including low temperatures and wind speeds for which the buildings have been designed. -- GAD

# CRREL BIBLIOGRAPHY

SIP 22563

629.11:551.578.46(\*7)

Baeza, Pedro Osvaldo  
ANTARCTIC LAND VEHICLES USED BY ARGENTINA. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 363-374 incl. illus., diagrs., 1963.  
DLC, Q180.A6S93

The first vehicles used by Argentina were Studebaker weasels. Motor toboggans were used as early as 1954, and in 1957 the unimog, a wheeled vehicle, was introduced followed by the muskeg and sno-cat in 1960. An analysis is made of the various vehicles, and a detailed description is given of the different models of sleds, specifying the materials used to build them. -- GAD

SIP 22566

656.19:629.114(\*2)

Expéditions Polaires Françaises, Bureau Technique  
MEDIUM WEIGHT TRANSPORT FACILITIES OF EXPÉDITIONS POLAIRES FRANÇAISES (E.P.F.). In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 400-414 incl. illus., diagrs., 1963.  
DLC, Q180.A6S93

The normal train consisted of a weasel, an aluminum sled, and a wanigan, all of which have been modified to meet the requirements. A new amphibious vehicle is presently being constructed to replace the weasel and be utilized for rough-ground transport. The combined operation of cargo planes, turbine helicopters, and medium-weight vehicles permits intensification of scientific research at relatively low costs. -- GAD

SIP 22564

629.114.2:551.578.46(\*743)

Smith, F. A.  
THE SNOW-TRAC, A USEFUL SCOUT VEHICLE. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 388-394 incl. illus., diagrs., 1963.  
DLC, Q180.A6S93

Two Porsche-powered ST-2 Snow-Tracs operated for 12 months at Mawson Station, and an ST-4 is now being tested. This report reviews their performance, maintenance, and some of the problems encountered during operation. A list is given of numerous modifications and recommendations to improve the efficiency of this weasel-like vehicle. -- GAD

SIP 22567

629.111.7:636.7(\*38)

Victor, Paul-Emile  
FOR THOSE WHO STILL USE DOGS AND SLEDGE. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 415-417, incl. diagrs., 1963.  
DLC, Q180.A6S93

The dog sled is used on the Greenland Ice Cap and in rough glacial marginal zones, mountains and fjords. The special features include runners for hard surfaces, skis extended aft for standing, handles, and other modifications. The article is merely an explanation of the accompanying design. -- GAD

SIP 22565

728.7:629.114.3

Smethurst, N. R. and R. F. M. Dalton  
THE DESIGN OF FIELD CARAVANS. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 395-399 incl. illus., diagrs., 1963.  
DLC, Q180.A6S93

A 4-berth, sled-mounted living caravan [wanigan] has been used extensively in field operations by ANARE. Alternative interior layouts have also been designed, and similar caravans have been used for radio communication and workshops at the plateau airstrip at Mawson. Detailed descriptions of the caravans are given. -- GAD

SIP 22568

629.11:551.578.46(\*7)

Murayama, M. and S. Maiba  
VEHICLES DESIGNED FOR AND USED IN J. A. R. E. 1956-62. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 419-449 incl. illus., tables, graphs, diagrs., 1963.  
DLC, Q180.A6S93

In the design and construction of Antarctic vehicles the interchangeability of machines, easy assembly and dismantling, and other requirements were taken into account. This report describes vehicles, sleds, wanigans, navigation instruments, and other auxiliary items, and the actual field experience and problems encountered during their operation. -- GAD

# CRREL BIBLIOGRAPHY

SIP 22569

621, 436:629, 114, 2

Malta, Sumio  
DIESELIZATION OF THE SNOW CAR AND THE ELECTRIC GENERATOR FOR THE JAPANESE ANTARCTIC RESEARCH EXPEDITION. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 450-466 incl. tables, diagrs., 1963.  
DLC, Q180, A6S93

The advantages of the diesel engines influenced their adoption in snow-cars, tractors, and engine-generator units, after actual field operational testing. These advantages are discussed in detail, and the materials and design specifications are tabulated. With the intention of utilizing the snow-car for overland exploration, research is being conducted on the future use of a turbo-supercharged diesel engine to replace the conventional piston engine. -- GAD

SIP 22570

629, 114, 2  
629, 111, 7

Grange, J. J. Ia  
THE REQUIREMENTS AND NATURE OF THE LOGISTIC SUPPORT FOR A SMALL NATIONAL ANTARCTIC EXPEDITION. (C. LAND VEHICLES). In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 469-472, 1963.  
DLC, Q180, A6S93

The author discusses the use of small-class tractors such as the Ferguson TE20, Weasel, Muskeg, Sno-Cat 743, and various types of sleds. The Muskeg is recommended for the "small expedition," and eight Maudheim sleds are considered sufficient. -- GAD

SIP 22571

656, 19:629, 114:551, 578, 4

Fuchs, V. E.  
SOME ASPECTS OF TRACTOR PERFORMANCE. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 473-476 incl. table, 1963.  
DLC, Q180, A6S93

This is a general discussion of the types of vehicles, fuels and maintenance under severe weather conditions. The selection of appropriate vehicles depends on the latitude, altitude, and terrain. Crevasses, type of snow, ice surface, and similar features demand certain specifications on the weight and design of vehicles. Considerate driving and maintenance of the vehicles are important factors in the successful operation of these vehicles. -- GAD

SIP 22572

629, 11:551, 578, 4(\*7)

Bentley, C. R. and J. B. Long  
OVERSNOW TRAVERSE VEHICLES AND SLEDGES. U. S. ANTARCTIC RESEARCH PROGRAM. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 477-482, 1963.  
DLC, Q180, A6S93

Various models of Tucker Sno-Cats have been used since the IGY. Gasoline-powered model 743 was used exclusively until 1960 when model 843 was introduced. The latter is diesel-powered, weighs 11 tons, and was designed for long-range operation on the polar plateau. Performance, fuel consumption, and other characteristics of these vehicles are discussed. Performance characteristics and other features of the Otaco 2-1/2 ton sleds, the one-ton sleds, and "Rolli-Trailers" are also discussed. In 1961-62 Thiokol Trackmasters proved easier to maintain than Sno-Cats, more economical in price and fuel consumption, but had less drawbar capacity. -- GAD

SIP 22573

656, 19:629, 114(\*38)

Homann, G. W.  
LOGISTICS OF ICE CAP SURFACE TRANSPORTATION. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 483-490 incl. illus., 1963.  
DLC, Q180, A6S93

The army travels on the Greenland ice cap throughout the year, in routine movements between Camps Tuto (elev. 1500 ft) and Century (elev. 8500 ft). The numerous crevasses along the trail are opened and backfilled to provide safe passage. The basic unit is the heavy swing, composed of a number of tractor trains. Each train includes an LGP (D-8) tractor pulling a series of wanigans or a combination of vehicles, and 10- and 20-ton sleds. The latest vehicle is a 10-ton wheel cargo transporter which operates on the road as well as the ice, thus saving equipment and labor in handling. In transporting fuel the Rolling Liquid Transporter was utilized, with its two tires holding 500 gals each, besides the regular metal ski-mounted tanks. -- GAD

SIP 22574

656, 19:629, 114(\*746)

Arctic and Antarctic Research Institute  
GROUND TRANSPORT OF SOVIET ANTARCTIC EXPEDITIONS. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 491-495 incl. table, 1963.  
DLC, Q180, A6S93

The specifications and technical features are tabulated for the vehicle types used for transport and research. The main transport for inland research

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are cross-country "Penguin," heavy-duty tractors, and cross-country "Khar'kovchanka" vehicles. The tractor train for the establishment of Komsomol'skaya Station included wanigans for living quarters, radio, galley, messroom, and sleds of fuel, food, equipment, etc. Tractor trains, tractors, and sleds are described for the different journeys and expeditions. -- GAD

used by New Zealand field parties. Bright colored "wyncol" material was used for distinction in monotonous terrain. Down clothing and sleeping bags have been extensively used by all field parties. A down vest for field and station use is also frequently used, with down-filled mittens and slippers. Down-filled clothing has reached a high standard of design and manufacture in New Zealand and is an important feature of the Antarctic clothing issue. -- GAD

SIP 22575

687:677.3(\*7)

Law, Phillip  
THE USE OF WOOLEN GARMENTS IN ANTARCTICA. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 517-519, 1963. DLC, Q180.A6S93

Wool absorbs moisture with simultaneous liberation of heat. Its susceptibility to moth presents no problem in the Antarctic, and its shrinkage is prevented without impairing the original properties of the wool. Woollen garments have been satisfactorily tried, and the possibility of cellular underwear knit from wool fibers is being currently investigated. A list is given of woollen garments issued by ANARE. -- GAD

SIP 22578

612:624.142

Millington, R. A.  
PHYSIOLOGICAL RESPONSES TO COLD. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 627-634, 1963. DLC, Q180.A6S93

The report reviews basic physiological responses to cold, the pathophysiology of hypothermic injury, and the primary mechanisms for the maintenance of thermal equilibrium. It discusses recent studies in cold acclimatization, their possible influence on future polar operations, and the broad physiological principles for the development of cold-weather clothing. -- GAD

SIP 22576

614.891.3

Black, H. P.  
A BLIZZARD VISOR FOR IMPROVED VISION. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 520-524, 1963. 4 refs. DLC, Q180.A6S93

A face mask has been devised which permits reading and adjusting instruments in blizzard conditions and winds up to 80 knots. The mask is essentially a double visor whose lower part protects the face from upward eddies. The complete visor is molded from clear plastic to fit the face and create a mild microclimate in front of the eyes and nose. The normal field of vision is considerably restricted, and peripheral vision completely blocked. The visor can be modified and adapted to sand- and dust-storm conditions. -- GAD

SIP 22579

687:624.148.7(\*7)

Arctic and Antarctic Research Institute  
COLD WEATHER CLOTHING FOR SOVIET ANT-ARCTIC EXPLORERS. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 635-638, 1963. DLC, Q180.A6S93

In the preparation of Antarctic clothing, the experience gained in the Arctic was utilized using the best models of cold weather clothing. The outer suit is made of water-proof cotton lined with cotton elastic material and camel wool combed to down-like pattern. Several types of suits are described including a storm suit with aluminum ice preserving coverage, and a leather suit of high quality kid and flannelette lining. Leather boots, fur flying boots, fur-lined sleeping bags, and fur caps are also described. -- GAD

SIP 22577

687:639.12:837.631(\*7)

Heine, A. J.  
FIELD CLOTHING FOR ANTARCTIC USE. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 599-600, 1963. DLC, Q180.A6S93

A summary is given of windproof and down clothing

SIP 22580

656.19:629.114(\*7)

Smethurst, N. R.  
THE ECONOMICS OF A D4 TRACTOR TRAIN TRAVERSE. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 641-656 incl. illus., appendixes A-G, 1963. DLC, Q180.A6S93

# CARREL BIBLIOGRAPHY

The paper discusses vehicles, sleds, fuel, food, packing, and other trail requirements. Appendixes A-G are as follows: (A) Mechanical Spares and Tools; (B) Medical Supplies; (C) Emergency and General Equipment; (D) Clothing; (E) Navigational Equipment; (F) Radio Equipment and Spares; and (G) Weekly recurring menu on three-month field traverse, 1961.  
-- GAD

SIP 22581

629.1.053:629.11

Black, H. P.  
A METHOD OF NAVIGATING OVER FEATURELESS SNOW SURFACES. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 660-663 incl. illus., diagr., 1963.  
DLC, Q180, A6S93

A system of two rear-viewing mirrors is mounted on the front of the vehicle, one facing the driver, the other directly above it at an angle facing backwards. A sighting rod is bolted to the rear of the vehicle so that the whole system is along a straight line passing through the center of the driver's seat. The driver can sight through the mirror system back to the rod, and align it with the vehicle's tracks or the vehicle following behind. Operating instructions and constructional details are given. (See also SIP 21472)  
-- GAD

SIP 22582

656:(\*38)

Expéditions Polaires Françaises, Service Operations  
OPERATIONAL PLAN OF THE INTERNATIONAL GLACIOLOGICAL EXPEDITION IN GREENLAND. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 671-688, incl. graphs, 1963.  
DLC, Q180, A6S93

This report is a general outline of operations, methods, and organization, extracted from the more detailed "Manual of Operations" of the E.G.I.G. of 1959-60. It includes descriptions of the scientific programs, climatic and geographical conditions, logistical operations, and a sequence of works and group travel graphs. The plan illustrates the systematic use of light-weight land equipment for outfitting independent groups by air, and the establishment of a small winter station under névé surface on the ice cap. The plan was used by personnel as a guide and information bulletin. -- GAD

SIP 22583

656:001.891(\*735)

Murayama, Masayoshi  
FIELD OPERATIONS IN J. A. R. E., 1956-62. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 689-693 incl. tables, 1963.  
DLC, Q180, A6S93

The report outlines field operations for scientific programs originating at Showa Station. Radio station facilities, field communications, and telegraphic code are discussed. The C-4 Gyrosyn compass system was used for navigation on the Antarctic plateau; its operational features are scrutinized. Future scientific observations will include altimetry, seismology, geology, glaciology, gravity and geomagnetic measurements, and cartography. -- GAD

SIP 22584

614.80:622.86(\*7)

Bridge, L. D.  
SEARCH AND RESCUE PROCEDURE AND SAFE PRACTICE IN ANTARCTICA. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 700-713, 1963.  
DLC, Q180, A6S93

This paper presents a thorough treatment of safety factors and practice essential to Antarctic operations. One-man operations, lack of safety equipment, risk-taking, etc., are only a few of the points against which warning is stressed. Personnel, aircraft, ships, vehicles, communications, and related operational instructions are discussed, with stress on the positive mental attitudes of personnel participating in the operation. -- GAD

SIP 22585

910.2:65(\*7)

Grange, J. J. la  
THE REQUIREMENTS AND NATURE OF THE LOGISTICS SUPPORT FOR A SMALL NATIONAL ANTARCTIC EXPEDITION. (E. FIELD OPERATIONS). In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 733-737, 1963.  
DLC, Q180, A6S93

The author recommends that a seismic program should not be included in the work of a small expedition, whereas a gravity survey could be easily accommodated. Topographic work is recommended if not more than two surveyors are required. One or two geologists should suffice; they can also perform glaciological tasks and make biological observations which do not require a biologist with the group. Meteorological and photographic instruments are essential and should be provided adequate space and care. The rest of the report deals with dogs and sledges. -- GAD



# CRREL BIBLIOGRAPHY

SIP 22586

654, 16(\*7)

Mason, Fred

COMMUNICATIONS PROBLEMS IN ANTARCTICA. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 742-744, 1963. DLC, Q180.A6S93

In 1959 a formal inspection of communication facilities at U.S. stations was carried out to determine and improve their reliability. The results showed that the equipment was antiquated, and newer equipment was installed. Other problems, however, still persist; for example, the exaggerated duration and frequency of ionosphere blackouts over the polar regions. One solution is VLF operation, but this requires gigantic antennas and ground systems. Another problem is communication between trail parties and bases. SSB equipment has eliminated part of this problem. A third problem is the collection and passing of meteorological data, for which a teletype system is recommended. -- GAD

SIP 22587

627, 95(\*7)

McDonald, Edwin A.

SEARCH AND RESCUE IN THE ANTARCTIC-UNITED STATES. In: Symposium on Antarctic Logistics (1962). Natl. Acad. Sci.-Natl. Res. Council, p. 745-749, 1963. DLC, Q180.A6S93

The report cites several besetment incidents and the rescue missions accomplished by the icebreakers. It is recommended that small cargo ships operating in Antarctic waters be improved by installing larger tugboat-pitched propellers and carrying a small helicopter for ice reconnaissance. Several plane mishaps are cited whose cause was whiteout. Precautions and proper safety procedures are emphasized. Most accidents which have occurred in the Antarctic have been the result of sole efforts, departure from well recognized safety rules, faulty judgment, and insufficient preparation. -- GAD

SIP 22588

551, 323, 7:551, 521:551, 524(\*3)

Zubenok, L. I.

INFLUENCE OF TEMPERATURE ANOMALIES ON THE ICE COVER IN THE ARCTIC. (Vliyanie anomalii temperatury na ledianoi pokrov Arktiki; Text in Russian). Meteorologiya i Gidrologiya, No. 6:25-30 incl. maps, 1963. 6 refs. DLC, QC851.M27

The equation for the radiation balance of sea ice is presented and it is shown how each of the components can be estimated and how the equation can be applied to estimate the thickness of ice melted in the winter to spring period. This equation plus an equation re-

lating the growth rate of sea ice to the number of degree days below freezing were used, together with the mean climatic data for the area, to compute the mean boundaries of drift and pack ice in March and Aug. for the Arctic. These boundaries agree well with the observed mean boundaries, particularly in the case of pack ice. The drift-ice boundaries are affected by current movements which are not considered in the equations. The same method of computation has been used to compute the effects on these boundaries of overall summer and winter temperature anomalies. The results are illustrated in chart form. -- Meteorol. and Geostrophys. Abstracts

SIP 22589

550, 34(\*7-11)

Kondrat'ev, O. K. and A. G. Gamburgsev  
SEISMIC EXPLORATION IN THE COASTAL PART OF EAST ANTARCTICA. (Seismicheskie issledovaniya v pribrezhnoi chasti Vostochnoi Antarktidy; Text in Russian). Moscow, Izd-vo Akad. nauk SSSR, 1963, 183p. Incl. illus., tables, graphs, diagrs. 88 refs. DLC, GB2597.K6

Introductory information is given on methods, structure of the medium, and wave records. Theoretical and experimental studies of waves in the ice are discussed, with emphasis on longitudinal refracted waves which were used to determine the structure of the medium. Seismogram studies indicated the nature of all the waves and of various factors affecting them. Wave studies of the crystalline basement surface are also discussed, especially reflection and refraction properties at the ice-rock interface. -- VDP/JFS

SIP 22590

551, 336:551, 241

Cohen, L.

PAST GLACIATIONS AND CONTINENTAL DRIFT. (Glaciations anciennes et derive des continents; Text in French). Soc. Géol. Belg., Ann., 88(1):10-64 incl. illus., May 1963. 329 refs. DLC, QE1.S5

The three parts of the text concern the general characteristics of tills and tillites, past glaciations, and general conclusions. The characteristics of glacial deposits include the rocky substrate of moraines and tillites, and the sediments associated with glaciers. Past glaciations are represented in all the continents, including the Buckeye Tillite of the Horlick Mountains, Antarctica. High latitudes are not sufficient to produce glaciations. Paleomagnetic results show that one pole was closer to Australia during the Triassic than during the Carboniferous or the Permian, yet there is no evidence of Triassic glaciation. -- GAD

# CRRREL BIBLIOGRAPHY

SIP 22591

551.324.431/.433(\*2)

Haefeli, R.  
HOW MUCH TIME IS NECESSARY TO BUILD UP AN ICE SHEET THE SIZE OF THE GREENLAND OR ANTARCTIC ICECAP ACCORDING TO THE GIVEN ACCUMULATION AND TEMPERATURE RELATIONSHIPS? (Welche Zeit ist notwendig, um unter gegebenen Akkumulations- und Temperaturverhältnissen einen Eisschild von der Grösse des grönländischen Inlandeises oder der Antarktis aufzubauen; Text in German). Polarforschung, 5(1/2):176-178 incl. tables, graph, diag., 1963, publ. Sept. 1964.  
DLC, G600, P6

The amount of time necessary to build an ice sheet with given climatic conditions to 95, 98, or 99% (Greenland 17,600 yr; Antarctica 70,000 yr), of its final height in the stationary condition is calculated. By given climatic conditions is meant constant accumulation, temperature, temperature of the earth's crust, etc., i.e., conditions which do not exist in nature. The differential equations used apply to lamellar as well as circular ice sheets. Numerical examples are presented from the Greenland and Antarctic ice caps. The view is confirmed that, in reality, the stationary conditions of an ice sheet can hardly be attained because the building process is constantly disturbed by short weather fluctuations. If the accumulation should stop, the decomposition of the ice sheet would progress very slowly; however, a temperature change would cause more rapid decomposition with an increase in the firn line. -- BLE

SIP 22592

551.324.4(\*7)

Mellor, Malcolm  
REMARKS CONCERNING THE ANTARCTIC MASS BALANCE. Polarforschung, 5(1/2):179-180, 1963, publ. Sept. 1964.  
DLC, G600, P6

Recent studies have given a good outline of the Antarctic mass economy but the final state of the balance remains uncertain. Published budgets indicate a large positive mass balance with surpluses in the range  $4.0-12.2 \times 10^{17}$  g/yr. Snow accumulation, estimated in the range  $1.34-2.55 \times 10^{18}$  g/yr, is the largest single budget item. A major source of error in estimates is the poor areal distribution of data, and therefore the possibility of correlating accumulation with a more widely measured parameter is examined. The accumulation data are used to predict the discharge of the Lambert Glacier after defining its drainage basin from surface form lines. Ice velocities for various parts of Antarctica are tabulated, including 20 values for ice shelves, 9 for unchanneled continental ice, 30 measured values for ice streams, and 22 ice-stream values estimated morphologically. Existing data suggest that ice shelves discharge icebergs at the rate of  $7.8 \times 10^{17}$  g/yr, while unchanneled continental ice produces bergs at only  $0.37 \times 10^{17}$  g/yr. Indirect evidence on the state of the mass budget is inconclusive. The ice margins

have shown no appreciable advance or retreat in recent decades. Transient temperature distributions in the ice reflect surface warming. -- BLE

SIP 22593

551.321:528.51(\*2)

Nottarp, Klemens  
HIGH-ACCURACY ELECTRONIC DISTANCE MEASUREMENT IN THE POLAR REGIONS. (Elektronische Distanzmessung hoher Genauigkeit im Polargebiet; Text in German). Polarforschung, 5(1/2):180-181, 1963, publ. Sept. 1964. 5 refs.  
DLC, G600, P6

During the International Glaciological Greenland Expedition (EGIG, 1959) and the Ross Ice Shelf Survey Expedition (RISS, 1962-63), tellurometers were used to survey snow levels. Later measurements will reveal flow direction and velocity of the ice masses and give a basis for mass balance calculations. The EGIG profile was a diagonal-quadrilateral network with about 10-km stake intervals. The average error was  $\pm 7.5$  cm<sup>2</sup>. The RISS profile, which measured other topographical relationships, was an extended polygonal traverse with about 8-km stake intervals. The accuracy and range of tellurometers are influenced by the large temperature gradients, snow drift, and the dielectric snow-air interface of the snow cover. In the air layer close to the surface, the determination of the refraction coefficient of air at the end points of the network does not suffice, on the other hand, it is practically impossible to make other meteorological measurements along the network simultaneously. Internal precision of the tellurometers is obtained by keeping the thermostat for the stabilizing crystals in constant operation and the scale frequencies regular ( $\pm 10$  Hz) with a special test gauge. The instruments should be protected from rough handling during transport, snow drifts, and condensation water. -- BLE

SIP 22594

551.345.1:624.139:622.24(\*440)

McGill University. Department of Geography  
DEEPEST PERMAFROST MEASUREMENT IN NORTH AMERICA. Polarforschung, 5(1/2):181-182, 1963, publ. Sept. 1964.  
DLC, G600, P6

On July 21, 1961, a thermistor cable was installed and kept open with casing to a depth of 2000 ft at Winter Harbour, Melville Island, N.W.T. The cable contains 25 thermistors, each on a separate circuit and spaced at regular intervals. Preliminary measurements, accurate to 0.01°C, indicate that sub-freezing temperatures extend to 1500 ft. The drilling-fluid temperatures at each depth will not approach their predrilling values for several years. The cable will be left permanently in place and read periodically. A site was selected for the second hole to be drilled further inland at a greater elevation. This hole will

# CRAEL BIBLIOGRAPHY

be cored throughout the depth to be instrumented. Thermal conductivity measurements on the core will permit a determination of the flow rate of heat from the earth's interior. An analysis of temperatures in the two holes will yield information on recent climatic changes and post-glacial emergence in the northern Canadian Arctic. -- BLE

SIP 22595 551.578.46:546.02(\*2)

Piccardi, Giorgio  
CHEMICAL MEASUREMENTS IN ANTARCTIC REGIONS. (Chemische Messungen in antarktischen Gebieten; Text in German with English abstract). Polarforschung, 5(1/2):184-186, 1963, publ. Sept. 1964. 16 refs.  
DLC, G600, P6

The results are presented of chemical tests (D-tests) made in polar and sub-polar zones. The experiments were made in Tromsø, the Kerguelen Islands, and Antarctica. The results are compared for a six-month period. Significant and negative correlations were found between the data gathered at Tromsø and Antarctica and between those gathered in the Kerguelen Islands and Antarctica. A significant and positive correlation exists between the data from the Kerguelen Islands and Tromsø. (Author's abstract, modified)

SIP 22596 551.578.46:536.5:551.521

Mellor, Malcolm  
A BRIEF REVIEW OF THE THERMAL PROPERTIES AND RADIATION (sic) CHARACTERISTICS OF SNOW. Polarforschung, 5(1/2):186-187, 1963, publ. Sept. 1964.  
DLC, G600, P6

In dry snow, with no forced convection, heat transfer can be analyzed by the standard heat conduction theory, utilizing a wide range of available solutions to the basic differential equation. Mathematical values are given for thermal conductivity, the diffusion coefficient for vapor diffusion in snow, apparent specific heat, latent heat of fusion and sublimation, thermal expansion, the spectral extinction coefficient for homogeneous snow, and the emissivity of snow. Reflectance depends on surface characteristics and sub-surface scattering and absorption. It varies appreciably with snow depth for thin snow covers. When deep snow is illuminated by diffuse light, spectral reflectance seems to decrease with increasing wave-length as required by the existing theory. In non-integrated direct sunlight, the converse occurs for some incidence angles. No correlation of reflectance with density has been found. -- BLE

SIP 22597 551.578.466:551.324.4(\*7)

Budd, W. and others  
SNOW DRIFTING AND THE MASS BALANCE OF THE ANTARCTIC ICE SHEET. (Schnee'egen im Massenhaushalte der Antarktis; Text in German). Polarforschung, 5(1/2):187-188, 1963, publ. Sept. 1964. 6 refs.  
DLC, G600, P6

Wind-transported snow is essential in explaining local variations in accumulation and ablation of the snow cover in Antarctica. Snowdrift was investigated at Byrd Station during 1962. On 129 occasions, snow samples were gathered simultaneously at 8 snow levels which formed a geometrical series between 3 cm and 400 cm. Wind velocities were measured at the same time at most of these levels. Other wind measurements gave the details of the wind profile in the 1000-m level over the snow. Also, the smoke from 12 rockets was photographed from 2 points at regular intervals. Other investigations were made of the size, form, and distribution of the crystals found in the drifted snow. Preliminary results indicate that the approximated exponential law that drifted-snow density decreases with an increase in depth must be modified with a consideration of particle-size distribution. The total mass transport of snow depends on the wind conditions in the higher layers of the atmosphere. Earlier snow-transport calculations, which place the strongest wind at lower elevations, may have underestimated the actual amount of snow transport in the Antarctic. -- BLE

SIP 22598 551.321:528(\*7)

Dorrer, Egon  
PRECISE ANGLE MEASUREMENTS IN THE ANTARCTIC. (Präzisionswinkelmessung in der Antarktis; Text in German). Polarforschung, 5(1/2):188-190, 1963, publ. Sept. 1964. 7 refs.  
DLC, G600, P6

As a continuation of the Ross Ice Shelf Studies (RISS), a geodetic traverse was made on the Ross Ice Shelf in the austral summer of 1962-63, to construct a survey network diagonally across the shelf ice in such a manner that the markers would be visible, despite snow accumulation, for from 2 to 5 yr. Three 2-man groups followed each other at 8-km intervals. The theodolite was placed on the upper end of a 2-m-aluminum pipe, which extended 50 cm above the snow, by the middle group. The targets were visible only from a telescope position. Details of the measurement procedure are given. Important environmental factors which influence such measurements in the polar regions are scintillation, poor contrast, and atmospheric refraction. The main obstacle on a flat surface is the curvature of the earth. The RISS expedition showed that it is possible to carry out geodetic traverses in polar regions with relative ease in a reasonable length of time. Suggested improvements include a special height-adjustable instrument stand, a light source as target, and the use of punch cards for recording observational data. -- BLE

# CAREL BIBLIOGRAPHY

SIP 22599

551.32(\*743/744)

Smith, Jan H. Landon  
REPORT ON GLACIOLOGICAL INVESTIGATIONS OF  
THE AMERY ICE SHELF IN THE ANTARCTIC.  
(Bericht über glaziologische Untersuchungen des  
Amery-Schelfeises in der Antarktis; Text in German).  
Polarforschung, 5(1/2):190-191, 1963, publ. Sept.  
1964.

DLC, G600, P6

The Amery Ice Shelf serves as an outlet area for 1/8 of the Antarctic ice sheet although lengthwise it comprises only 1/6 of the East Antarctic coast. Since 1956, the Australian National Antarctic Research Expedition (ANARE) has made aerial observations of the shelf. They have shown that, on the east and west peripheries, the ice shelf rises abruptly and then forms a plateau. These steep slopes show extensive crevasses along the sides. Strongly developed wave patterns were observed on the ice-shelf surface especially in the southern area. In the spring and summer of 1962, along a traverse from Mawson Station to the Amery Ice Shelf, a program was started to measure the relative and absolute movement of the shelf, and 10 pits were dug. The pit studies showed the effect of snow melt and simplified the estimation of yearly deposition. At depths greater than 2 m (ca. 3-yr deposits), 10- to 25-cm-thick layers of blue ice were encountered, which were intercalated with thin layers of coarse-grained firn. Similar layers were observed in crevasses from 2 to 12 m. The extent of this stratification implies high temperatures and considerable melting. In Feb. 1963, new cartographic measurements were made of the edge of the ice shelf. A comparison of these measurements with those made by the Soviets in 1957 shows a border movement of  $1500 \pm 300$  m/yr. -- BLE

SIP 22601

551.33:551.324.22(234.3)

Förtsch, O.  
VALLEY FORMS AND THE DEPOSITS UNDER THE  
GLACIERS IN THE ÖTZTALER ALPS. (Die Tal-  
formen und die Talfüllung unter den Gletschern der  
Öztaler Alpen; Text in German with English ab-  
stract). Polarforschung, 5(1/2):195-196 incl. table,  
1963, publ. Sept. 1964.  
DLC, G600, P6

Seismic refraction measurements were made between 1953 and 1961 on several glaciers in the Austrian Alps in order to study the elastic behavior of the ice, the ground moraine and bedrock, to determine the thickness and volume of the ice and ground moraine, and to explore the morphology of the bedrock. The sound velocity in the ice varies between 3000 and 3800 m/sec, that in the ground moraine between 3700 and 5200, and that in the bedrock, between 5400 and 6000 m/sec. The nature of the ground moraine is still unclear but it is known that the sound velocity therein is relatively high. The determination of the thickness of the ice and ground moraine has confirmed the presence of valley forms which have already been suggested by other observations. The presence of ground moraine and the form of the bedrock under the ice indicate the base of the ice also takes an active part in glacier dynamics. -- BLE

SIP 22602

91(091):551.501.9(680:99)

Burdecki, Feliks  
SOUTH AFRICA'S CONTRIBUTION TO SOUTH POLAR  
RESEARCH. (Süd-Afrikas Beitrag zur Südpolar-  
Forschung; Text in German). Polarforschung, 5  
(1/2):196-199 incl. graphs, 1963, publ. Sept. 1964,  
12 refs.  
DLC, G600, P6

During the First International Polar Year (1882-83), regular weather service was conducted along the South African coast by the Cape Meteorological Commission to compare the observational data collected there with data from the sub-Antarctic and the Antarctic, and to determine the possible relationship of weather in distant regions. During the Second International Polar Year (1932-33), the weather service was expanded, and weather observations were made by ship in Antarctic waters. The second advance into the Antarctic began in 1947 with the occupation of Marion and Edward Islands to establish weather stations. The last expedition took place after the IGY when Norway Station was taken over. It was used by the first two South African National Antarctic Expeditions (SANAE) in 1960 and 1961. The SANAE program includes, above all, meteorological and aerological observations; however, glaciological, geomagnetic, seismological, geological, and auroral observations were also conducted. Temperature data are given for 1960 and 1961. -- BLE

SIP 22600

551.593(\*2)

Schröder, W.  
RESULTS OF THE IGY AURORAL RESEARCH.  
(Über Ergebnisse der Polarlichtforschung im IGY;  
Text in German). Polarforschung, 5(1/2):192-194  
incl. table, 1963, publ. Sept. 1964, 14 refs.  
DLC, G600, P6

The results are discussed of auroral research during the IGY. Included in the discussion are the physics of aurora (origin, electrical properties, velocity, etc.), range, observations in Germany, frequency, auroral noises and geomagnetic disturbances, east-west movement, and methods of observation. -- BLE

# CIREL BIBLIOGRAPHY

SIP 22603 546.11.02.2:551.578.465(239.9-11)

Andersen, Bjorn G.  
DEUTERIUM VARIATIONS RELATED TO SNOW PIT  
STRATIGRAPHY IN THE THIEL MOUNTAINS, ANT-  
ARCTICA. Polarforschung, 5(1/2):200-201 incl.  
graph, 1963, publ. sept. 1964.  
DLC, G600, P6

The walls of a 5-m-deep snow pit displayed layers of porous coarse-grained snow and hard fine-grained snow. The coarse snow grains were formed through recrystallization mainly in summer, and most of the thickest layers of fine-grained wind-transported snow were deposited during winter. According to the stratigraphic interpretation, the 5-m deep section was deposited during the last 12 yr (1949-1962). Deuterium analysis of snow samples collected at 7-cm intervals show that the snow has a considerably higher deuterium content than the winter snow. In general, the isotope interpretation agrees well with the stratigraphic interpretation. (Author's abstract, modified)

SIP 22604 551.591.1:551.593:535.7(\*38)

Kasten, Fritz  
METEOROLOGICAL-OPTICAL INVESTIGATIONS ON  
THE GREENLAND ICE CAP. (Meteorologisch-  
optische (sic) Untersuchungen auf dem grönländischen  
Inlandeis; Text in German with English abstract).  
Polarforschung, 5(1/2):202-207 incl. table, graphs,  
1963, publ. Sept. 1964. 5 refs.  
DLC, G600, P6

Measured values are reported of total and visual albedo of the snow surface under overcast and clear skies as well as the corresponding albedos in several spectral ranges, vertical distribution of the luminance and radiance in several spectral ranges of a very cloudy sky and a snow surface, horizontal distribution of luminance, and near-infrared radiance of overcast skies of different intensities. The interdependence of these values and their relation to white-out are discussed. (Author's abstract, modified)

SIP 22605 551.324.63(\*7)

Rózycki, Stefan Zbigniew  
THE RHYTHM OF CHANGES IN THE ANTARCTIC  
ICE CAP UNDER THE INFLUENCE OF CLIMATIC  
VARIATIONS. (Der Rhythmus der Veränderungen  
des antarktischen Inlandeises unter dem Einfluss der  
Klimaschwankungen; Text in German). Polarfor-  
schung, 5(1/2):213-215, 1963, publ. Sept. 1964. 7  
refs.  
DLC, G600, P6

The East Antarctic ice cap covers a large lowland which is surrounded on 3 sides by a high mountain chain through which the ice has only a few outlets.

In the sector between 68° E and 154° E, the ice has relatively free movement all the way to the ocean. Almost 40% of the accumulation in this sector of the ice cap develops in the border area which is 10% of the total surface. Ice velocity in this area is 100-130 m/yr. The ice-front condition and the expansion of the inland ice is therefore determined by processes in the border area which strongly depend on climatic variations. If the inactive part of the inland ice is excluded from the calculations, it is noticed that, even with an over estimation of the precipitation, the decrease of the inland ice exceeds or at least equals the alimentation of the active border area. The extent of accumulation in the border area is determined by the precipitation and the wind transport of snow. The effect of climatic fluctuation is first noticed by changes in the elevation of the condensation zone. During cooler periods the front of the inland ice moves forward and the ice cap increases, while during warmer periods the surface decreases and the front moves southward. -- BLE

SIP 22606 551.578.462

Hofmann, Gustav  
HEAT BUDGET AND ABLATION OF THE SNOW  
SURFACE. (Wärmehaushalt und Ablation der  
Schneeoberfläche; Text in German). Polarforschung,  
5(1/2):216-218 incl. graphs, 1963, publ. Sept. 1964.  
DLC, G600, P6

Equations are presented which permit the determination of the relationships between snow-surface attrition and meteorological parameters. Ablation values are compared for various types of snow transformations, e.g., hoarfrost formation, condensation and freezing, condensation and melting, evaporation, and evaporation and melting. Essentially more ablation can occur from evaporation than from melting; more attrition takes place on ridges and peaks than on flat surfaces. -- BLE

SIP 22607 551.578.46:551.521

Bossolasco, M., G. Cicconi and Eva G. Flocchini  
SNOW METAMORPHOSIS AND SOLAR RADIATION.  
(Schnee-Metamorphose und Sonnenbestrahlung; Text  
in German). Polarforschung, 5(1/2):218-220 incl.  
graph, 1963, publ. Sept. 1964. 3 refs.  
DLC, G600, P6

During the winter of 1962-63, continuous measurements were made of snow-cover temperatures by placing thermistors and thermocouple elements at depths of 10, 20, 30, ... 70 cm. At the same time, daily density measurements were made at these depths. Continuous global-radiation and snow-cover-temperature measurements were also made. Solar radiation absorption is more effective in warming the snow than is heat conduction at the 10- to 12-cm level. A transition layer exists between 12 and 18 cm while heat conduction enters exclusively at lower depths.

# CRREL BIBLIOGRAPHY

The surface snow layers attain the lowest temperatures especially from nocturnal emanation which increases the vertical temperature gradient. Only in these layers are condensation processes able to develop. The layers between 5 and 15-18 cm remain relatively warm even at extremely low temperatures. This anomalous behavior of the upper layers shows that the treatment of heat conduction, according to Fourier's theory, is correct only for levels below 20 cm. Therefore, disregarding gross averages, the heat and temperature coefficients correspond well only at these depths. -- BLE

of sea ice in the Okhotsk Sea:  $122 \times 10^{10} \text{ m}^3$ ,  $32 \times 10^{10} \text{ m}^3$ , and  $55 \times 10^{10} \text{ m}^3$ . The Chishima Strait-current velocity was  $15 \times 10^3 \text{ m}^3/\text{sec}$ , 1/3 of which was attributed to the sea-ice melting in the Okhotsk Sea. The relationship among sea ice, Chishima current, water temperature at Hokkaido coasts, and cold damage was studied by means of yearly charges of the accumulated cold temperature (below  $-1.6^\circ \text{C}$ ), number of freezing days, and number of days with drift ice. When the number of days of freezing and drift ice is large, the extreme cold continues into the next summer even if the accumulated temperature is only average. -- CST/BLE

SIP 22608

551.34(\*732/\*733)

Bardin, V. I.  
SOME DATA ON THE CHARACTER OF PERIGLACIAL PHENOMENA IN QUEEN MAUD LAND (EAST ANTARCTICA). (Nekotorye dannye o kharaktere periglatsial'nykh yavleniy na Zemle Korolevy Mod (Vostochnaya Antarktida); Text in Russian). In: Problemy paleogeografii i morfogeneza v pol'arnykh stranakh i vysokogor'e. Edited by A. I. Popov. Moscow, Izd-vo Moskov. Univ., Geograficheskii Fakul'tet, 1964, p. 175-181, incl. illus., map. 8 refs.

DLC, QE501.M65

Field observations were made in Queen Maud Land in 1960-61 between  $15^\circ \text{E}$  and  $4^\circ \text{W}$  [Wohlthat Mountains, Mühlig-Hofmann Mountains] and at Shirmacher Ponds [near Novolazarevskaya Station]. Various forms of glaciers occur on the mountain slopes, although up to 30% of the slopes are ice- and snow-free. Physical causes of periglacial phenomena are described; exfoliation and nivation features are common. Periglacial phenomena vary with elevation and distance from the coast; several forms occur in the mountains but are not found along the coast. The forms are more numerous and varied on slopes facing north. The coastal and mountainous periglacial zones may co-exist depending on exposure and elevation (800-2500 m). -- VDP

SIP 22610

551.322:523.42/.44

Chang, Chung-ying  
A SUBTERRANEAN GLACIER ON MARS. (Huo hsing ti ti hsia ping hai; Text in Chinese). K'o hseue ta chung (Popular Science), No. 9:29, 1963. DLC, Orientalia Div.

A large quantity of water exists in the frozen state on Mars, which forms a "subterranean glacier." The average temperature at the Mars equator is  $-10^\circ$  to  $-20^\circ \text{C}$  and that in the polar regions is  $-60^\circ \text{C}$ . Thus the water is frozen all the time. The maximum thickness of the ice layer in the Mars equator region is 500 m while that in the polar region is 2000 m. The "Mars Ocean" is under the ice layer. Sometimes a white ribbon-like area appears suddenly on Mars. This is due to moisture oozing from cracks on the ice layer caused by collision with large meteors. (ATD abstract, modified)

SIP 22609

551.326.7:551.524(\*666)

Kurashina, Shōji  
THE SEA ICE IN THE OKHOTSK SEA, SEA CONDITIONS IN THE AREA OF SANRIKU, AND THEIR RELATION TO COLD-WEATHER DAMAGE. (Ohōtsuku kai no kaihō to sanrikuoki no kaihō narabini reigai tonō kankai ni tsuite; Text in Japanese with English abstract). Seppyō, 25(6):1-5 incl. tables, graphs, Nov. 1963. 13 refs.

DLC, Orientalia Div.

When the Okhotsk Sea ice increases, the current in the Chishima Strait strengthens and the cold-water area off Sanriku expands. This causes a deeper penetration of Arctic air and cold weather damage. Three previous estimates were made of the amount

SIP 22611

551.324(235.24)

Huang, Mao-huan  
SNOW AND ICE ON MT. HSI-HSIA-PANG-MA. (Hsi-hsia-pang-ma ti ping hseue shih chieh; Text in Chinese). K'o hseue ta chung (Popular Science), No. 9: 340-341 incl. illus., diags., Sept. 1964. DLC, Orientalia Div.

The formation process and movement were studied of a 13.5-km-long glacier on the northern side of Mt. Hsi-hsia-pang-ma (an 8012-m-high mountain in Tibet). Temperature measurements were made in 3 pits 5-10 m deep at an altitude of 5650-5900 m. The lowest temperature ( $-10.9^\circ \text{C}$ ) was measured 2 m below the ice surface. Only in the surface layer did the temperature reach  $0^\circ \text{C}$  in the summer. These temperature conditions are regarded as continental, in contrast with those of the European Alps which are oceanic. Ice structures were compared at different altitudes from 5650 to 7300 m. -- CST/BLE

# CRREL BIBLIOGRAPHY

SIP 22612

551.324:551.33(51)

Yen, Ch'in-shang, Shih-yüan Hsu and Ping-hui Jen  
SOME PROBLEMS OF PROMOTING STUDIES OF  
GLACIERS AND GLACIAL MARGIN IN CHINA.  
(Chin i pu k'ai char wo kuo ping ch'uan ping yüan  
fang mien yen chiu ti chi ko wen ti; Text in Chinese).  
Ti li hsüeh pao (Acta Geographica Sinica), 30(2):174-  
181, June 1964. 37 refs.  
DLC, Orientalia Div.

The development is summarized of glacier and glacial-margin studies in China, particularly since 1958. The study of modern glaciers includes glaciation, the utilization of melted ice, and glacial topography. Discussed under paleoglaciology are (1) geographical distribution and characteristics of ice ages, (2) the comparison and division of glacial epochs, (3) the evolution of glaciers, (4) the relationship between weather and glacier growth, and (5) the history of Quaternary glaciation. Studies of topography at the glacial margin include (1) evolution and characteristics, (2) classification, (3) the relationship between modern and ancient glaciers, and (4) economic aspects. -- CST/BLE

SIP 22613

551.33

Linton, D. L.  
THE FORMS OF GLACIAL EROSION. Inst. Brit.  
Geogr., Trans. and Papers, Publ. No. 33:1-28 incl.  
illus., diags., Dec. 1963. 47 refs.  
DLC, G7.16

This paper discusses ice-moulded forms (e.g., roches moutonnées and rock drumlins), troughs (Alpine, Icelandic, composite, and intrinsic types), and corries [cirques]. The elimination of preglacial valley divides and interfluvies by glacial erosion are also discussed. World-wide examples are given, with several illustrations, particularly from Antarctica. -- BLE

SIP 22614

551.322:548.51

Burley, G.  
ICE NUCLEATION BY PHOTOLYZED SILVER  
IODIDE. Phil. Mag. 10(105):527-534 incl. illus.,  
Sept. 1964. 15 refs.  
DLC, Q1.P5

A correlation has been established between the length of exposure of silver iodide to light prior to the establishment of nucleation conditions and the shape of the ice crystals formed at constant temperature. A silver iodide aerosol was prepared by gravity feeding a solution of 16 g of AgI and 4 g of NaI in 475 cm<sup>3</sup> of acetone into the flame of a micro-Bunsen burner through a hypodermic needle. An ice nuclei counter was used to evaluate the number of nuclei in an air

sample. Constant temperature was obtained by cooling the chamber walls to -20° C and maintaining that temperature until equilibrium with the entire air volume was reached. A control was run with room air before the start and at frequent intervals during a series of experiments. The shapes of ice crystals nucleated at constant temperature and under identical conditions of adiabatic cooling, changed with the cumulative length of exposures to ultraviolet radiation. Single crystal nucleation was investigated by mounting large single crystals of AgI on glass fibers and moving them slowly within a stream of cold air at about -20° C. After irradiation for periods from 1 to 4 hr by ultraviolet light, the basal plane crystals became the most effective nucleating site. The formation of ice crystals by this technique occurs in 2 stages, the first in the supercooled vapor and the second in the liquid. -- BLE

SIP 22615

551.417:551.331(\*49)

Rex, Robert W.  
ARCTIC BEACHES, BARROW, ALASKA. p. 384-400  
incl. illus., tables, graphs, diag., maps. (In:  
Papers in Marine Geology, Robert L. Miller (ed.),  
The Macmillan Co., N. Y., 1964). 23 refs.  
DLC, Q439.M5

The results are presented of a study of 4 mi of beach at Barrow, Alaska, during 1952-54, which included mapping, sounding, profiling, trenching, sampling, and laboratory analysis of the collected sediments. The report provides a case study of Arctic beach processes in an area of minor astronomical tides and describes beach features which might be indicators of an Arctic climate. The Arctic ice pack usually retreats from shore in mid-July and returns between Sept. and Dec. Ice push ridges are sometimes very spectacular. No deformed lamina were observed. Ice rafting may transfer coarse sediment from the surf zone to the subaerial portion of the beaches. During the freeze-up period, storms may produce a storm-ice foot which mantles the seaward side of the beaches. The annual cycle of beaches is the result of the interaction of adfreeze, ice-rafting of sediment, ice push, waves, and currents. The principal features of the cycle are the formation of the profile of wave-equilibrium followed by its modification by Arctic processes. During the adfreeze period, the beach grows by formation of the gravel-sand-ice foot. The main pack ice may move in at any time in response to changing wind and current conditions. Permafrost underlies all the beaches and extends to a depth of 670 to 1300 ft in the Barrow Base area. No pre-Pleistocene ice-wedge pseudomorphs similar to the modern ones studied at Barrow have been reported. -- BLE

# CARL BIBLIOGRAPHY

SIP 22616

551.32(08)(\*7)

Mellor, Malcolm (ed.)  
ANTARCTIC SNOW AND ICE STUDIES. Washington, Amer. Geophys. Union, Antarctic Res. Ser., vol. 2 (Natl. Res. Council Publ. No. 1197), 1964, 277p. incl. illus., tables, graphs, diagrs., maps, appendixes. Refs.  
DLC, GB2597, M39

Recent results are presented from Antarctic snow and ice research, including the work of the Ross Ice Shelf Survey. Since the IGY the U.S., by maintaining a vigorous Antarctic glaciological program, has made an impressive contribution of knowledge which is reflected in part by the 10 papers in this volume. New survey methods, geochemical techniques, and statistical data interpretations are some of the material presented. -- JFS

SIP 22617

551.32:551.324.4(\*747)

Cameron, Richard Leo  
GLACIOLOGICAL STUDIES AT WILKES STATION, BUDD COAST, ANTARCTICA. In: Malcolm Mellor, ed. Antarctic Snow and Ice Studies. Washington, Amer. Geophys. Union, Antarctic Res. Ser., vol. 2 (Natl. Res. Council Publ. No. 1197), 1964, p. 1-36 incl. illus., tables, graphs, diagrs., maps. 39 refs. Also: Diss. Abstr. 24(7):2867, Jan. 1964.  
DLC, GB2597, M39; Z5055, U5A53

Glaciological studies were conducted in the vicinity of Wilkes Station from Feb. 1957 to Jan. 1958 to determine the mass balance of the margin of the ice sheet. The environment of the marginal ice was determined utilizing three meteorological stations: a main base at sea level; S-1, 5 km inland, at 262-m elevation; and S-2, 80 km inland, at 1166-m elevation. The ice sheet inland of Wilkes Station receives little precipitation from cyclones, and there is little snow accumulation. Stake and shallow-pit studies of snow accumulation give values ranging from 7.9 to 15.9 g/cm<sup>2</sup>/yr. Studies in a deep pit at S-2 give an unusual mean accumulation of 13.3 g/cm<sup>2</sup> for the last 174 yr. Between S-1 and S-2 there is no pronounced variation in accumulation due to elevation or distance from the coast. Studies of 10-m temperature from the coast to 96 km inland give a lapse rate of 1.02°C per 100-m elevation. From 10- to 62-m depth at S-2 there is no discernible temperature gradient. Temperature gradients in the 10- to 28-m depth interval from S-2 to S-1 are positive and reach +2.8°C per 100 m at S-1. Total ice discharge along 167 km of Budd Coast is 5.43 km<sup>3</sup> of ice per year, equivalent to 4.9 km<sup>3</sup> of water. Calculation of the regime of the ice-sheet margin, an area of 9400 km<sup>2</sup>, indicates an excess of ablation over accumulation of 0.16 km<sup>3</sup> of water per year. (Author's abstract, modified)

SIP 22618

551.32(\*7-15)

Shimizu, Hiromu  
GLACIOLOGICAL STUDIES IN WEST ANTARCTICA, 1960-1962. In: Malcolm Mellor, ed. Antarctic Snow and Ice Studies. Washington, Amer. Geophys. Union, Antarctic Res. Ser., vol. 2 (Natl. Res. Council Publ. No. 1197), 1964, p. 37-64 incl. illus., tables, graphs, diagrs., maps. 12 refs.  
DLC, GB2597, M39

Glaciological studies are presented from the Ellsworth Highland traverse (1960-61) and the Antarctic Peninsula traverse (1961-62). Snow pit observations were superimposed on standard profiles of grain size, snow density, and ram hardness under idealized conditions. Annual accumulation boundaries were determined from snow crystal size and seasonal wind-packed layers. Snow crystal observations at Byrd Station during the 1961 winter showed that (1) precipitation during winter is in the form of very small crystals (<0.1 mm, but up to 0.5 mm), (2) hexagonal plate crystals and columnar group crystals are the most common types, and (3) solid needle crystals were occasionally observed. Accumulation in most parts of West Antarctica is highly dependent on geographic settings and on the tracks of storm depressions. Mean annual air temperature in Antarctica is controlled not only by latitude and elevation but also by specific locality. The lapse rate in West Antarctica, derived from 10-m snow temperature, is about 0.82°C/100 m. The rate of change of sea-level temperature with latitude is nonlinear. In the continental region it is: (1) -0.5°C/deg latitude (between 74°S and 83°S), (2) -1.7°C/deg latitude (83°-90°S), and (3) -1.1°C/deg latitude (74°-90°S). -- JFS

SIP 22619

551.324.54(\*765)

Zumberge, James H.  
HORIZONTAL STRAIN AND ABSOLUTE MOVEMENT OF THE ROSS ICE SHELF BETWEEN ROSS ISLAND AND ROOSEVELT ISLAND, ANTARCTICA, 1958-1963. In: Malcolm Mellor, ed. Antarctic Snow and Ice Studies. Washington, Amer. Geophys. Union, Antarctic Res. Ser., vol. 2 (Natl. Res. Council Publ. No. 1197), 1964, p. 65-81 incl. illus., tables, graphs, diagrs., maps, appendixes. 21 refs.  
DLC, GB2597, M39

Determinations of absolute movement, strain rates, and accumulation on the Ross Ice Shelf along the Dawson trail between Ross Island and Roosevelt Island are based on field observations in 1958, and on field measurements in 1959-60 and 1962-63. The change in geographical coordinates of most of the 20-mi stations established by Dawson shows a persistent northwest movement at an average of 800 m/yr for the shelf ice east of 175°W, and 1500 m/yr west of that meridian. These values are questionable because of the possible large error in Dawson's method of determining his position by solar fixes. The relative difference between the eastern and western velocities may be significant, however. The principal horizon-



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tal strain rate tensors at 20-mi intervals along the Dawson trail are based on strain rosettes. The values for the sum of the vertical strain rates at these stations generally confirm the values that Crary deduced by an indirect method. Strain orientation shows general agreement with some of the physical features of the shelf, but some anomalous patterns remain inexplicable. Calculations of bottom melting and freezing at various points along a N-S line roughly parallel to 169° W suggest that bottom melting decreases exponentially with distance from the seaward edge of the shelf to a zone between 40 and 100 km southward, beyond which bottom freezing begins. (Author's abstract, modified)

SIP 22620

551.32(\*765)  
551.506.5(\*765)

Hofmann, W., E. Dorrer and K. Nottarp  
THE ROSS ICE SHELF SURVEY (RISS) 1962-1963. In: Malcolm Mellor, ed. Antarctic Snow and Ice Studies. Washington, Amer. Geophys. Union, Antarctic Res. Ser., vol. 2 (Natl. Res. Council Publ. No. 1197), 1964, p. 83-118 incl. illus., tables, graphs, diagrs., maps. 9 refs.

DLC, GB2597.M39

The major purpose of the Ross Ice Shelf Survey was to determine the ice discharge from the Ross ice front. It was done by remeasuring a 695-km profile from Little America to Ross Island using tellurometers in combination with angle measurements. In addition, a 305-km N-S profile was measured along 168° W to determine the flow speed and deformation along an approximate flow line of the main influx of the Ross Ice Shelf coming down from Marie Byrd Land. A remeasurement of the markers along the profiles after an adequate interval (2-3 yr) will provide the changes in distance and angles necessary to determine the flow speed and deformation of the ice in the profiles. Distances, angles, coordinates, and data for reduction of tellurometer measurements are given for the stations along the profiles. Electronic distance measuring equipment and procedures of measuring are discussed. Dielectric measurements on snow were made and gave the following results:  $\epsilon = 1.66$  at a depth of 18 cm;  $\epsilon = 1.90$  at 180 cm. The meteorological observations necessary for the reduction of tellurometer distances are given and include air temperature at 60 and 260 cm above the snow surface, air pressure, wind speed, wind direction, cloud cover, and qualitative items of precipitation. -- JFS

SIP 22621

551.578.4:551.324.431(\*765)

Heap, John A. and Arthur S. Rundle  
SNOW ACCUMULATION ON THE ROSS ICE SHELF, ANTARCTICA. In: Malcolm Mellor, ed. Antarctic Snow and Ice Studies. Washington, Amer. Geophys. Union, Antarctic Res. Ser., vol. 2 (Natl. Res. Council Publ. No. 1197), 1964, p. 119-125, incl. illus., tables. 3 refs.

DLC, GB2597.M39

Snow accumulation near the northern edge of the Ross Ice Shelf and along 168° W is reported as a result of almost 2000 accumulation stake measurements and study of snow stratigraphy in 31 pits. The average accumulation near the northern edge of the ice shelf for the years 1960 through 1962 is calculated to be 14.4 g/cm<sup>2</sup>. This figure may be below the climatic average by as much as 10-30%. (Authors' abstract, modified)

SIP 22622

551.324.4:551.324.431(\*7)

Glovinetto, Mario B.  
THE DRAINAGE SYSTEMS OF ANTARCTICA: ACCUMULATION. In: Malcolm Mellor, ed. Antarctic Snow and Ice Studies. Washington, Amer. Geophys. Union, Antarctic Res. Ser., vol. 2 (Natl. Res. Council Publ. No. 1197), 1964, p. 127-155 incl. tables, graphs, maps. 88 refs.

DLC, GB2597.M39

Antarctica, excluding the region of the Antarctic Peninsula but including the ice shelves, has been divided into 10 drainage systems to facilitate studies of the mass budget. Using data from 336 locations, the mean net accumulation at the surface is estimated at  $15 \pm 3$  g/cm<sup>2</sup>/yr; the estimates for particular systems vary between  $8 \pm 2$  g/cm<sup>2</sup>/yr and  $52 \pm 11$  g/cm<sup>2</sup>/yr. Mass input for Antarctica as a whole is estimated at  $(2100 \pm 400) \times 10^{15}$  g/yr. The emphasis here is on errors in these estimates. The error in the estimate of net accumulation is examined as a composite error, including the error in the determination of the rate of accumulation at single locations, the error due to different interpretations of given sets of data used in compiling accumulation charts (data interpolation and extrapolation), and the error in computation of data that are not simultaneous for all locations. Incidental conclusions are drawn concerning the area (65,000 km<sup>2</sup>) and distribution of the zones of net ablation (4 segments extending along the coast between 40° and 135° E), the mean ice thickness ( $1700 \pm 300$  m), the ice mass  $[(21 \pm 4) \times 10^{21}$  g], and the accretion history of the ice sheet. It is suggested that a former ice cap, centered at 76° S, 125° W, was the last important accretion to the ice sheet. (Author's abstract, modified)

SIP 22623

551.578.46:551.321.7(\*7)

Kojima, Kenji  
DENSIFICATION OF SNOW IN ANTARCTICA. In: Malcolm Mellor, ed. Antarctic Snow and Ice Studies. Washington, Amer. Geophys. Union, Antarctic Res. Ser., vol. 2 (Natl. Res. Council Publ. No. 1197), 1964, p. 157-218 incl. tables, graphs, diagrs., maps, appendix. 27 refs.

DLC, GB2597.M39

An attempt has been made to determine the relation between compactive viscosity factor  $\eta_c$  and density  $\rho$  of snow from the density profiles observed at traverse stations and permanent bases. An observed

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density profile is transformed to the relation between density  $\rho$  and snow load  $\sigma$ . Assuming that the strain rate of densification is proportional to the vertical pressure exerted by the snow load and that the accumulation rate  $A$  is constant, a  $\rho \sim \sigma$  relation provides the relation between  $\rho \sigma$  ( $d\sigma/d\rho$ ) =  $A\eta_c$  and density. Plotting the values of  $\log(\rho \sigma d\sigma/d\rho) = \log(A\eta_c)$  against density, the relation between  $\log \eta_c$  and  $\rho$  can be obtained by subtracting the observed value of  $\log A$  from  $\log(\rho \sigma d\sigma/d\rho)$  for various values of density. The density is usually in the range 0.3~0.4 g/cm<sup>3</sup> at the surface and 0.5~0.6 g/cm<sup>3</sup> at 10-m depth. Some examples show good agreement between the calculated and the observed density profiles, but other density profiles calculated from pit data give values to the densities in the lower part which are too small compared with observed values. The observed densities from most traverse stations can be explained theoretically, considering some errors in the estimation of accumulation rate. But the densities observed on the Ross Ice Shelf and at Byrd Station are much lower than would be expected from theoretical considerations. (Author's abstract, modified)

SIP 22624

551.578.463/.465(\*772)

Koerner, R. M.  
FIRN STRATIGRAPHY STUDIES ON THE BYRD-WHITMORE MOUNTAINS TRAVERSE, 1962-1963. In: Malcolm Mellor, ed. Antarctic Snow and Ice Studies. Washington, Amer. Geophys. Union, Antarctic Res. Ser., vol. 2 (Natl. Res. Council Publ. No. 1197), 1964, p. 219-236 incl. illus., tables, graphs, diagrs., map, appendix. 14 refs.  
DLC, GB2597.M39

Examination of the firn stratigraphy between Byrd Station and Mount Chapman shows a cyclic pattern of grain size and crusts indicating an average annual accumulation of 13.5 g/cm<sup>2</sup>. The limits of accuracy of this value for accumulation cannot be cited because the characteristics of snow deposition in this area are not known. A network of 166 stakes has been set up between Byrd Station and Mount Chapman for direct measurement of snow accumulation. (Author's abstract)

SIP 22625

551.324.28:551.324.8:548.2(\*785)

Reid, John R., Jr.  
STRUCTURAL GLACIOLOGY OF AN ICE LAYER IN A FIRN FOLD, ANTARCTICA. In: Malcolm Mellor, ed. Antarctic Snow and Ice Studies. Washington, Amer. Geophys. Union, Antarctic Res. Ser., vol. 2, (Natl. Res. Council Publ. No. 1197), 1964, p. 237-266 incl. illus., tables, graphs, diagrs., maps. 51 refs.  
DLC, GB2597.M39

Firn folds up to 8 m high, with a wavelength about 100 m, are present in the vicinity of the Bay of Whales,

Ross Ice Shelf. They were formed through the convergence of two ice masses flowing around Roosevelt Island. In one of the folds an ice layer formed through the refreezing of meltwater produced during the summer season 1952-53. The crystal grains in the ice layer range from 4.5 to 2.5 mm in median diameter which is controlled by the intensity of solar radiation, the type and the amount of stress, and the content of air bubbles in the ice. The largest crystals occur where the solar radiation is most effective and where shear stress and air bubble content are at a minimum. The strongest preferred orientation of c axes (8-9% per 1% area) occurs about midway from crest to trough, where shear stress is theoretically greatest. Microfolds also exist at this site. The 'ideal' ice fabric pattern at this location consists of four c-axis maxima, centered at 21°, 26°, 27°, and 32°, respectively, from the pole to the shear plane. This pattern does not correspond to any other observed or theoretical pattern, with one possible exception, and appears partially to reflect some rotation of the stresses relative to the present fold axis. The c axes of crystals in an isolated secondary fold along the limb of the major fold are parallel to the bedding plane of each limb, which suggests that the ice layer deformed by translation glide along the basal glide planes of the ice crystals. (Author's abstract, modified)

SIP 22626

551.324.84(\*775)

Taylor, Lawrence D. and James Gliozzi  
DISTRIBUTION OF PARTICULATE MATTER IN A FIRN CORE FROM EIGHTS STATION, ANTARCTICA. In: Malcolm Mellor, ed. Antarctic Snow and Ice Studies. Washington, Amer. Geophys. Union, Antarctic Res. Ser., vol. 2 (Natl. Res. Council Publ. No. 1197), 1964, p. 267-277, incl. illus., table, graph, diagr. 18 refs. Also: Geol. Soc. Amer. Spec. Paper No. 76:164, 1964. Also: *Ibid.*:318-319.  
DLC, GB2597.M39; QE1.G2142

The quantity and size distribution of particulate matter in a firn core from Eights Station were determined by electronic analysis using a Coulter counter and following a modification of techniques introduced by E. W. Marshall and H. Bader. The concentration of particles with diameters between 1 and 3  $\mu$  was measured in 5-cm segments of a core 7.6 cm in diameter. Particle counts range from less than 1 to 250 per microliter of meltwater. Eleven cycles in particle concentration occur between a depth of 4.2 and 14.7 m. These cycles cover a span of about 22 yr as interpreted from the firn stratigraphy, and they generally exhibit an asymmetrical profile. Between 9.0 and 9.5 m, the particle count is unusually high compared to maximum counts for other cycles. This layer corresponds to the year 1952 if the particulate cycle is annual, or the year 1943 if the cycle covers 2 yr. Conditions producing the particulate cycle may include systematic changes in the supply, changes in the upper atmospheric circulation and tropospheric turbulence, and variations in snow accumulation and compaction. Terrestrial and extraterrestrial de-

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posits may be traceable laterally throughout an ice sheet. If further analysis indicates that a 2-yr or other cycle persists with depth, this fluctuation may be used for the absolute dating of ice at depths where other stratigraphic methods fail. (Authors' abstract, modified)

SIP 22627 551.336:551.72

Harland, W. Brian and Martin J. S. Rudwick  
THE GREAT INFRA-CAMBRIAN ICE AGE. *Scient. Amer.* 211(2):28-36 incl. illus., tables, diagrs., maps, Aug. 1964.  
DLC, T1.S53

Ice ages are reviewed in general and evidence is presented of a major glaciation in Infra-Cambrian times. A map shows the distribution of Infra-Cambrian tillites which provides an indication of glacial action. A geological time chart indicates the chronological relation of the Infra-Cambrian ice age to glaciations in Permo-Carboniferous and Pleistocene times. If all of the evidence is viewed without preconceptions about evolutionary processes, the suggestion is clear that at the end of the Infra-Cambrian period there was a phase of rapid and radical evolutionary change in animal life. -- BLE

SIP 22628 551.326.7:551.463.2:534.2(\*41)

Payne, F. A.  
EFFECT OF ICE COVER ON SHALLOW-WATER AMBIENT SEA NOISE. *J. Acoustical Soc. Amer.* 36(10):1943-1947 incl. graphs, diagrs., map, Oct. 1964.  
DLC, QC221.A4

Measurements were made from Dec. 1961 to April 1962, of ambient sea noise in the frequency interval 20-3000 cps in shallow water in the Gulf of St. Lawrence off the north coast of Prince Edward Island. The effect of ice cover on the frequency spectrum of the ambient sea noise is described. A block diagram is presented of the detection and recording equipment. Two methods of recording data were employed. A Sanborn logarithmic recorder was used to obtain pen-chart records of the hydrophone signals in the seven octave bands from 25-50 to 100-3200 cps. The noise samples recorded on magnetic tape were played back through a wave analyzer that resolved the noise sample into bands 5 cps wide at eight discrete frequencies. A correlation method was employed to analyze both sets of spectrum levels. The presence of an ice cover makes a large difference to the level and to the spectral distribution of the ambient noise. Results are presented which illustrate both the effect of ice cover on the ambient noise and the transition from the "open-water" to the "ice-cover" condition. -- BLE

SIP 22629

551.33(\*762)

Calkin, Parker E.  
GLACIAL GEOLOGY OF THE MOUNT GRAN AREA, SOUTHERN VICTORIA LAND, ANTARCTICA. *Geol. Soc. Amer., Bull.* 75(10):1031-1036 incl. illus., maps, Oct. 1964. 7 refs.  
DLC, QE1.G2

The Mount Gran area, encompassing Mount Gran and the ice-free Alatina Valley adjoining to the north, is located in the glaciated mountains of southern Victoria Land. At least two major glaciations are represented in this area. During the first and most extensive glaciation recognized, the A Glaciation, ice came from the inland ice plateau in the west, carved out the western end of Alatina Valley, and passed through the area to the Ross Sea in the east. During the second or B Glaciation, ice probably invaded the Mount Gran area from the coastal area in the east. This origin is suggested by the orientation of roche moutonnées and end moraines in Alatina Valley and lower elevations of Mount Gran. Such an invasion from the coast may have occurred when sea level was low and there was about 1200 m of ice in the McMurdo Sound-Ross Sea area. Ablation phenomena immediately adjacent to the glacier fronts suggest recent recession in the Mount Gran area. (See SIP 22421) (Author's abstract, modified)

SIP 22630

550.399:550.312(\*765)

Bennett, Hugh F.  
A GRAVITY AND MAGNETIC SURVEY OF THE ROSS ICE SHELF AREA, ANTARCTICA. *Res. Rept. Ser. No. 64-3*, Wisconsin Univ., Geophys. and Polar Res. Center, 97p. incl. tables, graphs, diagrs., maps, appendix, April 1964. 62 refs.  
DLC, Tech. Rept. Collection

This report contains a compilation and interpretation of all the gravity and magnetic data collected on the Ross Ice Shelf by recent ground traverses, and an airborne magnetic profile, flown during operation Highjump (1947). A map showing individual traverse routes on the ice shelf is given, and data sources are tabulated. The three layered velocity section measured at Little America Station by Crary (1961) is considered to be representative of the Ross Ice Shelf area. This assumption is supported by the fact that the Bouguer anomaly at Little America and the mean Bouguer anomaly over the ice shelf are similar. Thick sections of the low density layer are indicated in the central portion of the ice shelf, with an increase in thickness and elevation of the middle layer in the northwest portion. The upper "magnetic horizon" appears to be associated with the bottom or 6.38 km/sec layer which lies at a depth of 2.6 km at Little America. A deep "magnetic basement" also found in the Ross Sea area to the north may suggest geologic similarity between the two areas. The negative mean free air anomaly over the Ross Ice Shelf area is interpreted to be the result of former ice loading. -- BLE

# CRREL BIBLIOGRAPHY

SIP 22631

550.389(\*772:747)

Ostenso, Ned A. and Edward C. Thiel  
AEROMAGNETIC RECONNAISSANCE OF ANT-  
ARCTICA BETWEEN BYRD AND WILKES STATIONS.  
Res. Rept. Ser. No. 64-6, Wisconsin Univ. Geo-  
phys. and Polar Res. Center, 33p. incl. tables,  
maps, July 1964. 13 refs.  
DLC, Tech. Rept. Collection

Data were obtained during three field seasons (1958-61) from 13,000 km of airborne magnetics between 85° W and Wilkes Station. A Varian precession magnetometer recorded the absolute value of the earth's total field. This sector of Antarctica consists solely of young volcanics with the characteristic intense residual magnetic field. In contrast to the regions of West and East Antarctica, the Ross Ice Shelf is marked by relative magnetic quiescence, which suggests underlying material of low magnetic susceptibility. On the McMurdo to Pole flight, no anomaly is associated with the postulated fault zone along the northeastern flank of the Queen Maud Range. The depth calculations in West Antarctica that are near seismic soundings are in close agreement with the rock surface elevation determined by the reflection measurements. Thus it appears that the magnetic-anomaly sources occur at the rock surface. The observed field shows a generally higher value but lesser gradient than the computed field from H. O. 1703 S, although the contour orientations are similar. -- BLE

SIP 22632

551.509.6

National Science Foundation  
WEATHER MODIFICATION. FIFTH ANNUAL REPORT, 1963. NSF 64-19, 40p. incl. map, appendixes A-C, 1964. Refs.  
DLC, Unbound periodical

The report describes the weather modification programs of the National Science Foundation, other federal government agencies, and non-federal government organizations. NSF's efforts include pulsed-Doppler X-band radar analysis of weather features, artificial ice nuclei, Project Whitetop, Flagstaff Cumulus Studies (microphysics and dynamics of cumulus clouds), and financial aid to approved projects. Grants and contracts awarded in 1963 are described, and research continued from previous grants are listed along with an annotated bibliography. -- BLE

SIP 22633

548.1+.5

Tiller, W. A.  
DENDRITES. Science, 146(3646):871-879 incl. illus., tables, graphs, diagrs., Nov. 13, 1964. 16 refs.  
DLC, Q1.S35

Dendritic growth is exhibited by a wide variety of materials and the form is natural to all of the dominant phase transformations. This paper discusses the great variety of crystal and dendritic forms in nature along with the physics involved in the generation of these crystals during constrained and unconstrained growth. Technological applications of this knowledge are suggested. -- BLE

SIP 22634

551.322-539.3

Dooley, Donald  
OBSERVATIONS ON THE DEFORMATION OF ICE AT LOW STRESSES. Ohio State Univ., Inst. of Polar Studies, Rept. 12, [16]p. incl. illus., tables, graphs, diagrs., Aug. 1964. 7 refs.  
DLC, Tech. Rept. Collection

Observations on the deformation of ice under low values of pure shear stress were undertaken at the Institute of Polar Studies in 1963-64. Stresses of the order of 0.04 kg/cm<sup>2</sup> were applied to both polycrystalline and single crystal samples, the latter with the optic axis normal to the shear direction. In general, a terminal strain was observed after an immediate elastic deformation followed by an elastoviscous yield. The numerous anomalies observed and the lack of agreement with other reports on deformation studies indicate the necessity for additional work. (Author's abstract)

SIP 22635

551.525:551.345.1:551.481.1(\*440)

Brown, W. G., G. H. Johnston and R. J. E. Brown  
COMPARISON OF OBSERVED AND CALCULATED GROUND TEMPERATURES WITH PERMAFROST DISTRIBUTION UNDER A NORTHERN LAKE. Can. Geotechnical J. 1(3):147-154 incl. table, graphs, maps, July 1964. 4 refs.  
DLC, Unbound periodical

Borings and probings were made in the vicinity of a small lake near Inuvik, N.W.T., to determine the distribution of permafrost, and ground temperatures were observed to depths of 200 ft. The records were compared with theoretical calculations of ground temperatures. The mean annual ground-surface and lake temperatures and the geothermal gradient for the region were calculated with the help of an electronic computer program and measured temperatures at several locations. The annual temperature cycle for all practical purposes penetrates no more than 80 ft below the ground surface. Beyond this depth, temperatures are governed only by the mean annual temperatures at the ground surface under the lake and remote from it. There is no intrinsic change in mean annual temperatures with time. The mean ground temperature was calculated assuming the mean annual water and ground surface temperatures everywhere constant. Equations are given for calculating mean annual temperature at any location in the ground and for the entire traverse. The results

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show that the entire region under the lake is unfrozen, whereas under surface areas not covered by water the ground remains frozen to depths of several hundred feet. The field probings in the bore holes are all consistent with the theoretical results. -- BLE

SIP 22636

551.506.1(\*384.64)

Kosiba, Aleksander and Fritz Loewe  
METEOROLOGICAL OBSERVATIONS IN THE  
TASERSIAQ AREA, SOUTHWEST GREENLAND,  
DURING SUMMER, 1963. Ohio State Univ., Inst.  
of Polar Studies, Rept. No. 11, [59]p. incl. tables,  
graphs, diagrs., map, July 1964. 4 refs.  
DLC, Tech. Rept. Collection

Meteorological data obtained during the summer of 1963 in the Tasersiaq area in southwest Greenland are given and discussed in two parts. Part I discusses the meteorological elements (excluding wind). Part II concerns the wind relations in the region of Lake Tasersiaq and Sukkertoppen ice cap. The data from these observations are compared with data obtained at other locations. The wind data are especially useful in providing a better definition of calm characteristics. The results illustrate that great caution is necessary in choosing wind data to explain glaciologic, hydrological, soil, and other processes, as well as glacial changes in conditions as orographically different as those in Greenland. The problem of the genesis of the Sukkertoppen ice cap can be solved only through detailed investigations, especially of wind and radiation along the ice-cap profile in many directions. These two factors have the greatest influence on snow and ice accumulation, ablation, movement, and glacier mass balance. -- BLE

SIP 22637

551.33:551.324.51(\*701)

Robinson, Edwin S.  
SOME ASPECTS OF SUBGLACIAL GEOLOGY AND  
GLACIAL MECHANICS BETWEEN THE SOUTH POLE  
AND THE HORLICK MOUNTAINS. Res. Rept. Ser.  
No. 64-7, Wisconsin Univ., Geophys. and Polar Res.  
Center, 88p. incl. tables, graphs, diagrs., maps,  
appendixes I-IV, July 1964. 35 refs.  
DLC, Tech. Rept. Collection

The Transantarctic Mountain system is about 400 km wide in this area. Subglacial mountainous topography extends to within 150 km of the South Pole. Seismic refraction measurements indicate velocities characteristic of crystalline rock and show no evidence of a sedimentary section corresponding to the Beacon group. Reflection data suggest a thin layer of unconsolidated material at the base of the ice which may be locally frozen or water soaked. From limited knowledge of the magnetic character of rocks observed in the Transantarctic Mountains, volcanic flows similar to the late Tertiary, and Quaternary

McMurdo volcanics are the most probable source of local magnetic anomalies observed south of the Horlick Mountains. Bouguer anomaly variations indicate possible areas of accumulation of sediment eroded from the nearby mountains. The range of Bouguer anomalies indicates a continental crustal section from 40 to 50 km thick. The area is in isostatic equilibrium and local topographic provinces are not locally compensated. Existing theories about the behavior of ice are insufficient to explain the character of the ice surface and its relationship to variations in ice thickness. (From author's summary)

SIP 22638

551.326.7:536.2(\*60)

Untersteiner, N.  
CALCULATIONS OF TEMPERATURE REGIME AND  
HEAT BUDGET OF SEA ICE IN THE CENTRAL  
ARCTIC. J. Geophys. Res. 69(22):4755-4766 incl.  
tables, graphs, Nov. 15, 1964. 27 refs.  
DLC, QC811.J6

The equation of heat conduction, including variable thermal conductivity and specific heat, an internal heat source diminishing with depth, and an advective term, is integrated numerically for sea ice of equilibrium thickness. The annual cycle of thickness (ablation-accretion) is imposed as an external parameter. The boundary values for temperature and the vertical distribution of ice salinity are taken from empirical data. The computed temperature field is in good agreement with observations. The thermal history of individual particles of ice, the relative effect of the internal heat source (penetrating solar radiation), heat storage, and the annual cycle of heat flux by conduction at various depths are described. The observed maximum of brine volume at 40- to 70-cm depth is explained as the combined effect of salinity profile and internal absorption of radiation. The requirement that heat flux in the ice plus the heat equivalent of surface ablation equal the heat flux in the atmospheric boundary layer is well met by Badgley's values of radiative and turbulent heat transfer. During the melting season, June 15 to Aug. 20, the ice surface receives 4.5 kcal/cm<sup>2</sup> and loses, during the freezing season, Aug. 21 to June 14, an only slightly greater amount of heat to the atmosphere. The annual sum of heat conduction at the base of the ice is 3.6 kcal/cm<sup>2</sup>. Of this, 2.0 kcal/cm<sup>2</sup> originates from ice accretion and 1.6 kcal/cm<sup>2</sup> is drawn from the ocean. The atmosphere over the central Arctic receives an annual total of 2.5 kcal/cm<sup>2</sup>, which is mainly the heat of fusion of exported ice. (Author's abstract)

# CRRRL BIBLIOGRAPHY

SIP 22639

551.578.7:551.508.85

Geotis, Spiros G.  
COMMENTS ON PAPER BY DAVID ATLAS,  
KENNETH R. HARDY, AND JÜRGE JOSS, "RADAR  
REFLECTIVITY OF STORMS CONTAINING SPONGY  
HAIL." J. Geophys. Res. 69(22):4907-4908, Nov.  
15, 1964.  
DLC, QC811.J6

Atlas et al (1964) (SIP 22008) have rejected all pre-  
vious hypotheses concerning the radar reflectivity of  
storms containing spongy hail as physically implausi-  
ble - and rightly so. However, the validity of the  
original radar observations can not be confirmed.  
The measurements of Donaldson and the apparently  
confirming ones by Atlas (1963) were made by turning  
down the receiver gain and photographing either PPI  
or RHI radarscopes. Several uncertainties are asso-  
ciated with this technique; therefore, the extraordi-  
narily high reflectivity values should be viewed with  
extreme skepticism. The discrepancy in observa-  
tions is due to the characteristics of the radars and  
radar measurements rather than the structure of the  
thunderstorm. -- BLE

SIP 22640

551.578.7:551.508.85

Atlas, David, Kenneth R. Hardy and Ralph J.  
Donaldson, Jr.  
REPLY. J. Geophys. Res. 69(22):4909-4910, Nov.  
15, 1964. 8 refs.  
DLC, QC811.J6

This note is intended to validate 2 fundamental aspects  
of the authors' paper (SIP 22008) which Geotis (SIP  
22639) has questioned. The magnitude of 3-cm re-  
flectivities in thunderstorms and the reality of the  
maximum reflectivity observed sometimes at high  
altitudes in these storms must be considered as  
lower-limit estimates of the true reflectivity.  
Douglas (1964) has obtained similar results inde-  
pendently. The significance of hailstones containing  
spongy ice as an explanation for the observed reflec-  
tivity profiles in severe storms is explained.  
Spongy hail provides the physical means of obtaining  
a backscattering cross section corresponding to that  
of the first peak of the Mie scattering curve for  
water. The fact that the experimental measurements  
indicate an enhancement of 3 db over that of a sphere  
of pure water further reduces the required concen-  
tration of these stones. -- BLE

SIP 22641

551.578.7:551.508.85

Joss, Jürg  
REPLY. J. Geophys. Res. 69(22):4911, Nov. 15,  
1964. 3 refs.  
DLC, QC811.J6

In reply to Geotis' claim that the interpretation  
(Atlas et al, 1964) (SIP 22008) of previous radar ob-

servations is based on reflectivity measurements of  
unrealistic artificial hailstones (Joss, 1964), the  
author explains that recent experiments show that  
the thickness of the spongy layer is not the important  
factor. The decisive point is the ratio of the liquid  
water to the total mass of the hailstones. It seems  
safer, in this case, to base speculations about the  
reflectivity of a hail cloud on the measurements of  
artificial hailstone models until better reflectivity  
data are obtained for natural hailstones. -- BLE

SIP 22642

551.332.56(77)

Bretz, J. Harlen  
CORRELATION OF GLACIAL LAKE STAGES IN  
THE HURON-ERIE AND MICHIGAN BASINS. J.  
Geol. 72(5):618-627 incl. illus., maps, Sept. 1964.  
9 refs.  
DLC, QE1.J8

The two major concepts are discussed regarding cor-  
relation of the stages in these basins. Jack Hough's  
latest (1963) attempt to correlate these events con-  
tains fundamental errors which are fatal to his  
scheme. They involve denials of field facts reported  
in the literature and statements that seem to indicate  
lack of personal field examination and of adequate  
study of topographic maps. The first and most de-  
tailed organization of then existing knowledge of the  
succession of Glacial Great Lake stages was by  
Leverett and Taylor (1915). Although studies by  
many later investigators have added much informa-  
tion and have altered some of the original correla-  
tions, the Leverett and Taylor picture has stood the  
test of time. Since 1915, the Huron-Erie and the  
Michigan glacial lake levels, with proposed correla-  
tions, have had the most attention. (Author's ab-  
stract, modified)

SIP 22643

551.337:551.79

Wright, H. E., Jr.  
THE CLASSIFICATION OF THE WISCONSIN GLA-  
CIAL STAGE. J. Geol. 72(5):628-637 incl. table,  
Sept. 1964. 45 refs.  
DLC, QE1.J8

The classification of the Wisconsin Stage by Frye and  
Willman combines into Woodfordian time the inter-  
vals Tazewell, Cary, and Port Huron of the Lake  
Michigan lobe because these intervals, unlike the  
Twocreekan that follows, cannot be defined or traced  
satisfactorily on a stratigraphic basis. Despite this  
difficulty, these intervals serve as convenient car-  
bon-dated subdivisions of a 9000-yr fluctuating re-  
treat of a central ice lobe in the Great Lakes region  
to which the glacial fluctuations in Minnesota and  
elsewhere can be compared. The classification re-  
lates the end of the Valderan Substage to the supposed  
end of sea-level rise 5000 yr ago. A better termina-  
tion would be the change from spruce to pine or hard-  
woods in the pollen sequence which can be related to

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the withdrawal of the ice from the Great Lakes, identified stratigraphically over a wide area, carbon-dated as nearly synchronous, and referred to an abrupt climatic change. (Author's abstract, modified)

SIP 22644

551.34(\*428)

Westgate, J. A. and L. A. Bayrock  
PERIGLACIAL STRUCTURES IN THE SASKATCHEWAN GRAVELS AND SANDS OF CENTRAL ALBERTA, CANADA. J. Geol. 72(5):641-648 incl. illus., tables, diagrs., graphs, Sept. 1964. 21 refs.  
DLC, QE1.J8

The Saskatchewan gravels and sands are composed primarily of quartzitic sandstones, chert, and arkosic sandstones, together with a few fragments of basic volcanic rock, limestones and bedrock of local derivation. They have been recognized widely throughout the plains of western Canada and the northwestern United States, lying unconformably upon bedrock and covered with glacial drift. Ages from late Tertiary to early Pleistocene have been suggested for these gravels and sands. Near Edmonton, Alberta, temporary exposures in a gravel pit revealed structures in the Saskatchewan gravels and sands that are attributed to deformation by frost action. These structures are (1) a zone of deranged pebbles, (2) involutions, and (3) fossil ice wedges, now full of sand. It is concluded that (1) a periglacial climate existed in central Alberta before the arrival of the Keewatin ice that deposited the Wisconsin till; (2) the Saskatchewan gravels and sands were deposited in a periglacial environment; and (3) these gravels and sands are older than the "classical Wisconsin" but they are of Pleistocene age. (Authors' abstract, modified)

SIP 22645

551.336:551.79(51)

Kozarski, S.  
PROBLEM OF PLEISTOCENE GLACIATIONS IN THE MOUNTAINS OF EAST CHINA. Z. Geomorphologie, 7(1):49-70 incl. illus., diagrs., map, April 1963. 34 refs.  
DLC, G1.A47

The literature is reviewed and observations (1958) in Sishan near Peking and in Lushan (Kiangsi) are discussed. Traces of this glaciation were discovered in the Taipei-shan, Wutaishan, and the Great Khingan mountain regions. Traces were also found in the Hwawangshan, the Western Hupeh, Tapashan, Szechwan, and the Lower Yangtze regions. In Western Hupeh, south of Patung, and Tzukuai, where only traces of the Lushan glaciation were found, the height of the snow line of this glaciation was about 1000 m above sea level. Traces of three glaciations were discovered in the eastern Tapashan. During the Tsiuwanse (oldest), which corresponds to the Taku glaciation, the snow line was about 1000 m above sea

level; during the Huang-pokiang (Lushan) glaciation it was about 1200 m, and during the Takiuhu (youngest) it was 2200 m above sea level. -- BLE

SIP 22646

551.343.2

Hastenrath, S.  
LARGE SCALE DISTRIBUTION OF PATTERNED GROUND. (Zur Frage der grossräumigen Verteilung von Froststrukturböden; Text in German). Z. Geomorphologie, 7(1):85-87, April 1963. 8 refs.  
DLC, G1.A47

Contrary to earlier findings, patterned ground is also to be expected in suitable soil below the timber line on mountains, and in and on the border of dry regions, i.e., a zone which is different from the patterned ground between the upper timber line and the snow line. Further research is necessary. -- BLE

SIP 22647

551.579.2(\*50)

Chernyshev, A. A.  
VELOCITIES OF SNOWMELT RUNOFF IN FORESTS AND FIELDS. Soviet Hydrology: Selected Papers, No. 6:621-622 incl. table, 1963.  
DLC, Unbound periodical

Seventy measurements were conducted in the Chernigov, Sumsk, and Kharkov Provinces. The timber was 24 to 25 yr old, its fullness ranged from 0.6 to 0.8, and the undergrowth was of average density. Some of the measurement sectors were thawed while others were frozen. Tabulated data show average runoff rates of snowmelt over various types of surfaces, at various steepness, and at varying depths of the water layer, and indicate that (1) runoff rate is directly proportional to the slopes, (2) at an increase in the water layer depth, the velocity increases regularly, (3) runoff velocities are smaller in the forests than in the fields, and (4) if the forest soil is frozen while it is thawed in the field, the runoff velocities are the same. -- BLE

SIP 22648

551.32:528.3/.4(\*765)

Hofmann, Walther  
GEODETIC-GLACIOLOGICAL WORK IN THE ANTARCTIC. THE ROSS ICE SHELF SURVEY (RISS)--OPERATION 1962-63. (Geodätisch-glaziologische Arbeiten in der Antarktis. Das Ross Ice Shelf Survey (RISS)--Unternehmen 1962/63; Text in German). Z. Vermessungsw. 88(6):255-265 incl. table, maps, June 1963. 1 ref.  
DLC, TA501.Z5

The RISS program is discussed in the framework of the IGY research program in the Antarctic, and the glaciological situation on the Ross Ice Shelf is described together with the geodetic-glaciological survey program. -- BLE

# CRREL BIBLIOGRAPHY

SIP 22649

551.322:548.51:551.508.72

Barnes, Geoffrey T., Ulrich Katz and Raymond Snger  
ICE FORMING ACTIVITY AND THE SURFACE PROPERTIES OF NUCLEATING MATERIALS. Z. angew. Math. Phys. 13(1):76-80 incl. table, graph, 1962. 7 refs.  
DLC, QA1.Z37

The results of cloud-chamber experiments with AgI indicate that the activity of a particular site on the surface of a particle can be characterized by the difference in chemical potential or free energy required for the formation of a stable ice crystal nucleus upon it. It would be more reasonable to refer to a threshold free energy difference rather than a threshold temperature and to plot the ice forming activity as a function of this free energy rather than of temperature. The amount of liquid adsorbed at constant temperature is directly related to the relative humidity, therefore, the formation of ice embryos which begins in the adsorbed water layer on the nucleating particle at lower relative humidities may be hindered by a lack of adsorbed water. Probably incipient embryos are continually forming and disappearing with a frequency determined by the temperature, the amount of adsorbed liquid, and the nature of the particle surface. The term "ice forming nuclei" for denoting active substances is preferred to the terms "freezing" and "sublimation" nuclei which imply specific mechanisms. -- BLE

SIP 22650

551.525:551.58(\*49)

Aitken, G. W.  
GROUND-TEMPERATURE OBSERVATIONS AT NORTHWAY, ALASKA. Tech. Rept. 107, U. S. Army Cold Regions Research and Engineering Laboratory, 14p. incl. illus., tables, Oct. 1964.  
CRREL files

Summaries are presented of (1) ground temperature data at 9 depths from 0.0-20.0 ft collected daily at Northway (Alaska) during 1952-1960, (2) comparative climatological data collected by the U. S. Weather Bureau for the years 1952-1961, and (3) soil data from samples obtained in Sept. 1952 and Oct. 1961. Tables are given of (1) the mean or average climatological data, (2) the maximum, minimum, and average ground temperatures for the 11 yr as determined from data recorded on the first day of each month, and (3) the ground temperatures recorded the first day of each month during the 1952-1960 period. Ground-temperature gradients for a typical thaw and freeze season (1954-55) are graphed and the maximum and minimum temperatures recorded at each depth are also presented. The depth to permafrost was about 4.5 ft. The layer of summer thaw refroze completely down to permafrost each year during the observational period. (Author's abstract)

SIP 22651

552.6:551.322

Astapovich, I. S.  
ICE METEORITES. (Ledfanye meteority; Text in Russian). Priroda (Moscow), No. 5:84-85, 1964. 10 refs.  
DLC, Q4.P8

A block of ice weighing several kilograms fell at the village of Domodedovo near Moscow on Aug. 27, 1963. Analysis revealed that it was of terrestrial origin. This paper discusses past theories of ice meteorites, most of which are fantastic or have been proven wrong. For example, the falling of precipitation from a cloudless sky was once attributed to the melting of ice meteors on entry into the earth's atmosphere. Particular attention is given to the falling of an ice meteorite in Wisconsin on Aug. 30, 1955. Meteor matter is associated with comets, therefore ice meteorites may have the ice nuclei of comets as their source. In a footnote, K. P. Florenskii emphasizes the importance of continuing the study of the problem, and calls on readers to be alert for the falling of such objects. -- JPRS abstract, modified

SIP 22652

551.50:910.2.008(\*7)

Skifarov, V. M.  
PREPARATIONS FOR THE WORK OF THE AEROMETEOROLOGICAL DETACHMENT OF THE NINTH SOVIET ANTARCTIC EXPEDITION. (Podgotovka k rabote aerometeorologicheskogo otdela 9-i Sovetskoi antarkticheskoi ekspeditsii; Text in Russian). Meteorologiya i Gidrologiya, No. 6:43-45, 1964.  
DLC, QC851.M27

This paper discusses (1) the selection of proper personnel for this mission who possess the required technical, physical, and psychological attributes, (2) the preparation of the work program and specialized pre-departure training, (3) the steps taken to ensure adequate supplies and equipment, and (4) the methods of testing instruments to be used in the Antarctic. The principal objectives of the detachment were (1) the collection of synoptic, meteorological, actinometric aerological and other data needed to study the Antarctic atmospheric circulation and climate, and the determination of the influence of Antarctica on general circulation of the atmosphere for the improvement of weather forecasting; (2) the study of the formation, development and breakup of shore ice and the hydrological regime of coastal waters; and (3) participation in the EASY program. In comparison with previous expeditions, plans included ozonometric observations at Mirnyy, an increase in the number of daily aerological observations in special geophysical intervals at all stations, and greater attention to ice research at Mirnyy. -- JPRS abstract



# CRREL BIBLIOGRAPHY

SIP 22653

551.508.822:551.506.2(\*7)

Zhdanov, L. A. and A. B. Petrov  
RESULTS OF SOUNDING THE ANTARCTIC ATMOSPHERE WITH A-22 RADIOSONDES. (Rezultaty zondirovaniya atmosfery radiozondami A-22 v uslovnykh Antarktidi; Text in Russian). Inform. Bull. Antarkticheskoy Eksped., No. 45:33-38 incl. tables, diagrs., 1964.  
DLC, Q115.8686

Methods to correct radiosonde-launching difficulties caused by strong winds are described. The recently adopted automatic recorder has proven highly satisfactory. The height reached by radiosondes depends on the method used to process balloon envelopes. The best results are obtained when the envelopes are wetted with gasoline on both sides 1 to 1-1/2 hr before launching. This procedure, among others, made it possible to attain a mean height for the year of 25.9 km. Cases were observed when there were sharp warnings in the lower stratosphere at 20-27 km from -75 to -65°C and from -22 to -30°C. In Nov. the transformation was traced of the circumpolar cyclone into a stratospheric anticyclone. The frequency of recurrence is tabulated of different directions of jet streams. During the period Feb.-Dec. 1962, of the 117 days with jet streams, their average duration was 2 days. The mean height of the jet-stream axis was below the tropopause and only in individual cases was it above the tropopause, which increases in height upon the appearance of jet streams. The height of the tropopause, at the time of jet streams, exceeds the mean monthly height of the tropopause. The increase in height of the tropopause, caused by a sharp wind intensification in the free atmosphere or the appearance of jet streams, is a basic prognostic criterion which was used to prepare Antarctic forecasts and storm warnings. -- JPRS abstract, modified

SIP 22654

551.326:528.28(211)

Bushuev, A. V.  
ASTRONOMICAL OBSERVATIONS ON DRIFTING ICE AND WAYS TO INCREASE THEIR ACCURACY. (Astronomicheskie nabludeniya na drevfufushchem l'du i puti povysheniya ikh tochnosti; Text in Russian). Problemy Arktiki i Antarktiki, No. 13:97-100 incl. tables, diagrs., 1963.  
DLC, G575.L422

Detailed investigations of the drifting of ice, the dynamics of an ice cover, tidal currents, etc., made in recent years show the necessity for increasing the accuracy of determination of the coordinates of drifting stations. Solar observations at different times cannot ensure the required accuracy due to the drifting of the ice. Astronomical observations on drifting stations therefore should be made during the entire year. In order to determine the coordinates

of a single station the zenith distances of four stars should be measured. Their azimuths should differ by 90°. In order for the drifting ice during the time of astronomical observations not to influence the accuracy of determination of coordinates, the azimuths of the second, third and fourth stars should differ from the azimuth of the first star by 90°, 270°, and 180° respectively. The determination of coordinates from five stars is preferable. Optical theodolites should be used since they permit daily observations and check the change in the inclination of the ice cover. Nomograms have been compiled to determine the azimuths of celestial bodies. Methods are described for reducing zenith distances of celestial bodies to the mean time of observation.  
-- JPRS abstract, modified

SIP 22655

551.326.83:621.311.2(\*50)

Gotlib, I. A. L. and others  
THE ICE AND THERMAL REGIME OF THE ANGARA RIVER. (Ledotermika Angary; Text in Russian). 196p. incl. illus., tables, graphs, diagrs., Lenin-grad, 1964. 41 refs.  
DLC, Slavic Div.

A general picture of the hydrographic and orographic features of the Angara River region is given, and the ice and thermal regimes of the river are described in accordance with research carried out in connection with the planning and building of hydroelectric power plants at the Angara waterfall. Ice conditions from fall to spring were studied, beginning with the ice-forming process in autumn. Observations regarding sludge flow are given, the complete freezing of the river is described, ice thickness at various points is tabulated, and general characteristics of the spring ice breakup are given. Information is furnished for hydrologists and hydrotechnicians for projecting, planning, and building hydroelectric power plants in cold regions. -- VDP

SIP 22656

551.508.71

Ballinger, J. G. and others  
ALPHA RADIATION HYGROMETER. VOLUME I, AUTOMATIC FROST-POINT HYGROMETER FOR STRATOSPHERIC WATER-VAPOR MEASUREMENTS. Final Rept., Contract AF 19(604)-8418, Honeywell Inc., Aeronautical Div., Minneapolis, Minn., 52p. incl. illus., graphs, diagrs., appendixes A-B, Aug. 15, 1964. 10 refs. [AFCRL-64-690 (I)]  
DLC, Tech. Rept. Collection

This report describes a new type of automatic frost-point hygrometer for measuring atmospheric distribution of water vapor. The mass of the frost deposit on a cooled surface is detected directly by energy attenuation of alpha radiation. An automatic control maintains a constant amount of this frost by controlling the direction of current flow through a thermoelectric cooler. The instrumentation of this hygrometer is described in detail, and balloon-flight tests of prototype units are presented. (Authors' abstract)

# CRREL BIBLIOGRAPHY

SIP 22657

551.508.71

Crowley, John E. and Ahmet F. Konar  
ALPHA RADIATION HYGROMETER. VOLUME II,  
FROST-POINT HYGROMETER FOR W-47 AIRCRAFT.  
Final Rept., Contract AF19(604)-8418, Honeywell  
Inc., Aeronautical Div., Minneapolis, Minn., 95p.  
incl. illus., tables, graphs, diagrs., appendixes  
A-D, Aug. 15, 1964. 44 refs.  
DLC, Tech. Rept. Collection

A hygrometer system which obtains frost point temperature readings during weather reconnaissance flights has been designed. The hygrometer, which consists of a probe mounted to the aircraft skin, projecting beyond the aircraft boundary layer, and an amplifier-controller located in the aircraft electronic equipment bay, is capable of measuring frost-point temperatures in the dew point range of +30° C to -50° C with an accuracy of 1.5° C. The probe obtains an air sample from outside the aircraft boundary layer and directs the sample to the cold junction of a thermoelectric cooler. The probe's construction restricts the air over the cold junction to static pressure for a wide range of Mach numbers and angles of attack. The cold junction of the thermoelectric cooler condenses moisture from the air sample until the condensate reaches a predetermined thickness, which is measured by alpha particle absorption techniques. A solid-state alpha particle detector controls the thermoelectric cooler current to maintain the condensate thickness. The temperature of the cold junction (frost-point temperature) is measured with a miniature bead thermistor. One system was made for wind tunnel and environmental testing and two were designed for flight tests on the W-47 and U-2 aircraft. (From authors' summary)

SIP 22658

551.508.71

Ballinger, J. G., M. P. Fricke and R. D. Murphy  
ALPHA RADIATION HYGROMETER. VOLUME III,  
CURRENT PROBLEMS IN STRATOSPHERIC WATER-  
VAPOR MEASUREMENTS MADE WITH AUTOMATIC  
FROST-POINT HYGROMETERS. Final Rept., Con-  
tract AF19(604)-8418, Honeywell Inc., Aeronautical  
Div., Minneapolis, Minn., 32p. incl. graph, Aug.  
15, 1964. 16 refs. [AFCR-64-690 (III)]  
DLC, Tech. Rept. Collection

Two basic problems inherent in the stratospheric application of all automatic frost-point hygrometers are examined. In particular, instrument inadequacy due to low rates of mass transfer is found to be a highly probable explanation of the current controversy about upper-atmosphere water-vapor content. The second problem is that of moist-air-sample contamination by water vapor desorbed from the instrument package and vehicle. The magnitude of this effect precludes a simple accommodation of low mass transfer rates by use of long sampling times. Measures to increase the reliability of future stratospheric data are recommended. (Authors' abstract)

SIP 22659

551.321(021)(-82)

Savel'ev, B. A.  
MANUAL ON THE STUDY OF ICE PROPERTIES.  
(Rukovodstvo po izucheniiu svoystv l'da; Text in Rus-  
sian). Moscow, Izd-vo Moskovskogo Universiteta,  
1963. 198p. incl. illus., tables, graphs, diagrs.  
52 refs.  
DLC, GB2403.S2

Chapters in the manual deal with: (1) The study of the structure of ice and snow by a recommended crystal optical method. Procedure is given for preparing snow and ice sections, photographic reproduction, and comparative evaluation of the results. A method which summarizes many structural elements in a single diagram is presented. (2) Methods of investigating the chemical composition of ice, melt water and brine. (3) Study of the liquid and solid phases of saline ice. (4) Methods of determining density and porosity. Special attention is paid to the method of radioactive logging used by A. V. Krasnushkin in 1959 in Antarctica. (5) Methods of analysis of gas inclusions in ice. (6) Basic methods of testing the strength of ice. (7) Study of thermal and radiation properties of ice. -- VDP

SIP 22660

551.345.1:624.139(\*50)

Anisimov, V. V. and M. I. Krinitsyn  
PIPELINE CONSTRUCTION IN PERMAFROST RE-  
GIONS. (Stroitel'stvo magistral'nykh truboprovodov  
v raionakh vechnoy merzloty; Text in Russian).  
Leningrad, Gos. Nauchno-tekhnicheskoe izd-vo,  
1963, 146p. incl. illus., tables, diagrs., appendixes  
I-III. 14 refs.  
DLC, Slavic Div.

Pipeline construction, natural conditions (e. g., permafrost thickness and temperature, ground water, relief, and climatic peculiarities), and the physical and mechanical properties of frozen soil in permafrost regions are discussed. Highway construction and methods of supplying goods to remote areas are emphasized, and recommendations are made for storing motor vehicles, tractors, and other mechanical devices out of doors in freezing weather. Excellent illustrations and diagrams are included. -- VDP/BLE

SIP 22661

624.144.53/.55(\*50)

Karaban, G. L.  
SNOW REMOVAL EQUIPMENT. (Snegouborochnye  
 mashiny; Text in Russian). Rev. ed., Moscow,  
Izd-vo Ministerstva Kommunal'nogo Khoz'faystva  
RSFSR, 1962. 124p. incl. illus., tables, graphs,  
diagrs. 25 refs.  
DLC, TL230.5.S5K3

Data on physical and mechanical properties of snow and ice and information on the present methods of

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clearing snow and ice covered roads in winter time are given. Special attention is paid to the description of USSR and foreign equipment for snow removal, and to the methods of computation of their capacity, performance, and maintenance as well as to the cost of operation. Information is provided to engineers and technicians in city management and to universities and technical schools specializing in municipal work. Snowplows, sweepers, scrapers, shovels and loaders are equipment types emphasized in the seven chapters of the manual which is a revised edition of a publication issued in 1955. (See SIP 13947) -- VDP

SIP 22662 551.326.7/.8:53:54(\*3)

Savel'ev, B. A.  
STRUCTURE, COMPOSITION AND PROPERTIES OF THE ICE COVER OF SEA AND FRESH WATERS. (Stroenie, sostav i svoystva ledianogo pokrova morskikh i presnykh vodoemov; Text in Russian). Moscow, Izd-vo Moskovskogo Universiteta, 1963. 541p. incl. illus., tables, graphs, diagra. 236 refs. DLC, GB2405.S2

On the basis of laboratory and field observations made from 1939 to 1955 in various Arctic regions at shore and drift stations and on board ship (mainly in the Kara Sea) the following are discussed: (1) Ice structure during ice cover formation, growth and melting. (2) Ice composition, migration of brine, and bottom freezing in shallow sea waters. (3) Distribution of porosity in the ice cover and seasonal changes in porosity. (4) Thermal properties, expansion, and radiation related to absorption of radiation energy by various kinds of snow and ice. Including instruments for measuring heat conductivity. (5) Elasticity of ice and effects of temperature, salinity, phase composition, porosity and structure on the strength of the ice cover. -- VDP

SIP 22663 551.345:612.592(\*532.6)

Florensov, A. A.  
PERMAFROST AND ITS IMPORTANCE IN THE ETIOLOGY AND PATHOGENESIS OF THE ENDEMIC UROVSKAYA (KASHIN'S AND BEK'S) DISEASE IN THE EASTERN TRANS-BAIKAL REGION. (Vechnaya merzloty pochvy i ee znachenie v etiologii i patogeneze endemicheskoy urovskoy (Kashina-Beka) bolezni v Vostochnom Zabaikal'e; Text in Russian). p. 56-59 incl. graph. (In: Voprosy Meditsinskoy Geografii Sibiri i Dal'nego Vostoka, by Institut Geografii Sibiri i Dal'nego Vostoka, Akad. nauk SSSR, Sibirskoe Otdelenie). Irkutsk, Irkutskoe Knizhnoe Izd-vo, 1961. DLC, RA927.S6

The data collected suggest that permafrost, as one factor in a cold environment, not only affects the geophysical phenomena of the region (mostly along the Urov River, Chita Region), but can also have a direct effect on human beings by radiation cooling.

The action of the cold swells the body joints making them difficult to bend, and delays the growth of limbs. It affects particularly children from the time they begin to walk barefoot or work in the fields in direct contact with the cold earth. -- VDP

SIP 22664 551.345.1(\*50)

Shvetsov, P. F.  
PERMAFROST, ITS OCCURRENCE AND IMPORTANCE. (Merzlye sloi zemnye ikh rasprostraneniye i znachenie; Text in Russian). Moscow, Izd-vo Akad. nauk SSSR, 1963. 102p. incl. illus., graphs, diagra. maps. DLC, Slavic Div.

Earlier and recent theories concerning the origin and existence of permafrost are reviewed, and the absorption, transformation, and reflection of solar radiation by permafrost are discussed. The distribution, thickness, and temperature of permafrost in the USSR are outlined, and the composition, structure, and properties of frozen rocks are described. The effect of permafrost on other environmental conditions, the practical utilization of permafrost regions, and the effect of industrial activity on permafrost regions are also discussed. The most recent USSR publications on permafrost are reviewed. -- VDP/BLE

SIP 22665 624.139(\*50)

Berezovskii, B. I.  
SOME SPECIAL FEATURES OF CONSTRUCTION IN THE FAR NORTH. (Nekotorye osobennosti stroitel'stva v usloviyakh kraynego severa; Text in Russian). Moscow, Gos. izd-vo lit-ry no stroitel'stvu, arkhitekture i stroit. materialam, 1963. 159p. incl. illus., tables, graphs, diagra., map. 34 refs. DLC, TH153.B42

Climatology, geological factors, permafrost, and ice cover characteristics in the extreme North are reviewed. The protection of buildings and installations from snow drifts, snow protection devices, and mechanized snow removal methods are studied. Transportation, site selection, and construction methods are examined, and advice is given regarding preparatory soil work and methods of building foundations. The manual is a revised and expanded version of the 1960 edition. (See SIP 19594) -- VDP

SIP 22666 551.578.46+.49(437)

Chomicz, K.  
SNOW AND AVALANCHE RESEARCH IN THE TATRA MOUNTAINS. (Hó- és lavinakutatás a Tátrában; Text in Hungarian with German and Russian abstracts). Mőjarás, 66(3):138-146 incl. illus., graphs, map, May-June 1962. DLC, QC851.M125

# CRREL BIBLIOGRAPHY

Snow and avalanche research is being conducted in Poland, in the western part of the Sudeten area, and mainly in the Tatra Mountains, which, besides the usual measurements (snow depth, density, total water content), is also concerned with the physical properties of snow (temperature, crystal structure and size, porosity, strength, and stratification) as well as its spatial and temporal variations. From the description of the physical conditions and the results, as well as the weather conditions of the avalanche in the Tatra which occurred in March 1960, it is concluded that this research is very important for the practical requirements of daily life.  
(Author's abstract)

SIP 22667

551.324(575.32)

Akademik Nauk Uzbekskoi SSR. Institut Matematiki  
THE FEDCHENKO GLACIER, VOL. II (Lednik  
Fedchenko, Tom II; Text in Russian with English  
summary). Ed. by V. L. Shul'ga. Tashkent, Izd-vo  
Akad. Nauk Uzbekskoi SSR, 1962. 198p. incl. illus.,  
tables, graphs, diagrs., maps. 33 refs.  
DLC, GB2508. F4A5

The second volume analyzes the results of the IGY Expedition of 1957-1960 to the northwestern Pamirs. (For Volume I see SIP 20526). It is divided into the following chapters: I. The solar radiation, II. The glacier basin climatic conditions, III. Some problems of surface heat balance, precipitation accumulation, melting and drainage of snow. The Fedchenko glaciers receives an enormous quantity of solar heat, on the average 190 kcal/cm<sup>2</sup> in the firn zone and about 145 kcal/cm<sup>2</sup> in the terminus. The variation of the solar radiation with elevation is irregular. Changes of radiation balance parameters are related to the seasons, atmosphere, orography, and climatic circulation. An account is given of problems pertaining to the unequal distribution of snow accumulation in the glacier basin and the glacier water balance. The rate of melting on different parts of the glacier surface varies: the exposed slopes melt first, then the pure ice, and last the morainal ice. The melted snow discharges into the Seldara River bed. -- VDP

SIP 22668

551.322:539.6

Jellinek, H. H. G.  
LIQUID-LIKE (TRANSITION) LAYER ON ICE.  
Special Rept. 70, U. S. Army Cold Regions Research  
and Engineering Laboratory, 18p. incl. graphs,  
diagrs., Oct. 1964. 32 refs.  
DLC, Tech. Rept. Collection

A survey is presented of the literature covering about the last 100 yr concerning a liquid-like transition layer on ice below its melting point. In 1850, M. Faraday observed that if 2 pieces of ice at 0°C or higher ambient temperature are slightly contacted, they freeze together because of a water film between the two surfaces. Tyndall accepted Faraday's view,

coined the term regelation, and attempted to explain glacier flow by this theory. J. Thomson explained regelation by pressure melting and opposed Faraday's and Tyndall's views. In 1951, Weyl pointed out that in an ionic crystal lattice there is polarization near the surface, distorting the lattice in the uppermost surface layer. He suggested a similar phenomenon for ice. A liquid-like layer exists not only near the melting point but considerably below it. The author investigated the adhesive properties of ice by carrying out tensile and shear experiments with ice frozen to various surfaces such as stainless steel, optical flat quartz, and various polymers. Only cohesive breaks occurred with tensile experiments, but shear experiments gave adhesive breaks; the strength depended on the rate of shear, surface finish, and temperature. Most evidence to date is strongly in favor of the liquid-layer theory; however, more knowledge is needed about the properties of such a layer. Possible methods of obtaining such information are suggested. -- BLE

SIP 22669

551.321.7(+38)

Mock, Steven J. and Donald L. Alford  
INSTALLATION OF ICE MOVEMENT POLES IN  
GREENLAND. Special Rept. 67, U. S. Army Cold  
Regions Research and Engineering Laboratory, 6p.  
incl. illus., tables, graphs, diagrs., map, appen-  
dixes A-C, Jan. 1964. 3 refs.  
CRREL files

Snow-movement poles were installed at the former HIRAN sites on the Greenland ice sheet during May 1963, to prevent the loss of these positions through snow accumulation. Four of the six HIRAN sites were found. The stations and erection techniques are described. Stations 29 and 30 were not found and were probably buried by excessive drifting. Measured snow accumulation at the three sites visited ranged from 31% to 83% greater than estimated. Annual accumulation, in water equivalent, estimated from observed accumulation and depth-load curves, is from 35% to 100% greater than the accumulation rates obtained from pit studies. Since no other Greenland sites have shown accumulation increases of this magnitude for this period and since considerable drifting was expected around the camp sites, these annual accumulation rates have little significance. Stations 26, 27, 28, and 31 should remain visible for at least 9 yr. Radar reflections can be substantially improved by increasing the surface area. Future markers to be located by radar should be made in the form of a square tower, approximately 2 x 2 ft, similar to the tower at station 31. Aluminum is a satisfactory material. -- BLE

SIP 22670

551.578.7

Das, Phanindramohan  
INFLUENCE OF WIND SHEAR ON THE GROWTH OF  
HAIL. J. Atmospheric Sci. 19(5):407-414 incl.  
table, graphs, appendix, Sept. 1962. 16 refs.  
DLC, QC851.A283

# CRRRL BIBLIOGRAPHY

A cloud model is developed under conditions of vertical wind shear, and the growth of hailstones in the model is computed assuming the initial existence of hail embryos. The basic cloud model has idealized distributions of temperature and liquid water content which are determined from the mean hail sounding for the Denver region. The computations are based on the Schumann-Ludlam formulation of the hail problem. It is concluded that there is a higher probability of hail in thunderstorms formed under strong vertical wind shear than those without shear. The maximum size attainable by hailstones is greater in a cloud without shear than in one with shear, provided the strength of the updraft, the vertical distributions of liquid water content, and the temperature are the same in the formation core of the two clouds. In the absence of vertical shear, the updrafts required for the formation of large hailstones must be decelerated near the top of the "liquid" water cloud in order to prevent the hail embryos from being blown out into the "glaciated portion" of the cloud. (Author's abstract, modified)

SIP 22671

551.578.7(540)

Mukherjee, A. K., S. K. Ghosh and G. Arunachalam  
HAILSTORMS AT GAUHATI ON 18 MARCH 1961.  
Indian J. Meteorol. and Geophys. 13(2):213-217 incl. illus., table, graph, April 1962. 9 refs.  
DLC, QC851.1285

The size, shape, and structure of the hailstones and the meteorological conditions of 5 hailstorms at Gauhati Airport, India, on March 18-19, 1961, have been studied. The development of the hailstorms was not associated with any special synoptic situation but they were accompanied by strong vertical wind shear. A sharp rise in pressure was associated with the occurrence of hailstones, most of which were elementary with opaque cores, contained air bubbles, and had a density of about 0.8 gm/cm<sup>3</sup>. -- BLE

SIP 22672

551.521.1/.2(\*41)

Orvig, Svenn  
NET RADIATION FLUX OVER SUB-ARCTIC SURFACES. J. Meteorol. 18(2):199-203 incl. tables, graph, April 1961. 9 refs.  
DLC, QC851.A283

Measurements of net radiation made in the vicinity of Knob Lake, Quebec, are discussed, and the instruments and methods of using them are described. On the basis of 994 readings with a portable net radiometer during one summer, it is concluded that the readings give useful results even when taken at varying intervals throughout the day. It is possible that the relationship found between short wave radiation and daytime net flux may be used to obtain approximate mean daytime flux values from observations of total daily solar radiation only. During the summer, there were 14 hr of positive net radia-

tion flux per day. Maximum positive net flux occurred near noon. Zero net flux occurred symmetrically, approximately 7 hr before and after noon. Net radiation flux and solar radiation were found not to be correlated with evapotranspiration because the good vegetation in this area allows only small amounts of evapotranspiration. The ratio of measured evapotranspiration to latent evaporation is only 0.0018 in./cc, against 0.0034 in./cc at more southerly locations in Canada. Evapotranspiration can be obtained from measurements of latent evaporation, which was found to be highly correlated with solar radiation ( $0.795 \pm 0.058$ ). -- BLE

SIP 22673

551.578.7

Donaldson, Ralph J., Jr.  
THE SHAPE OF THE HAIL AREA IN THUNDERSTORMS. J. Meteorol. 18(3):416-419 incl. illus., table, graph, diagr., June 1961. 3 refs.  
DLC, QC851.A283

With a knowledge of the probability of hail occurrence at a point in a thunderstorm, and of the hail/heavy-rain duration ratio, also observed at a point in a thunderstorm, conclusions may be derived regarding the instantaneous size and shape of the hail area relative to the total storm area covered by heavy rain, under the assumption of steady-state conditions (an integrated average of the actual conditions in a thunderstorm). Examples of the geometric relationships are given, supporting statistics are given, and a comparison is made with radar data. -- BLE

SIP 22674

551.322.548.51:551.510.43(\*7)

Bird, I. and others  
ATMOSPHERIC ICE NUCLEI IN HIGH SOUTHERN LATITUDES. J. Meteorol. 18(4):563-564 incl. diagr., Aug. 1961. 8 refs.  
DLC, QC851.A283

Observations of ice-nucleus concentrations at sites remote from population centers have been compared with observations made at sea at various positions between Australia and Antarctica to determine whether land-origin dust particles contribute significantly to Southern Hemisphere ice-nucleus concentrations. Thirteen sets of measurements were made aboard ship on 8 days between Jan. 12 and Feb. 23, 1960, with an expansion cold box. The individual measurements showed no more scatter than is normally found with land measurements, while the curves of the number of nuclei active as a function of temperature were typical of those for other Southern Hemisphere locations. It is concluded that land-origin dust does not contribute greatly to nucleus concentrations in the Southern Hemisphere. If the nuclei are of marine origin, their source is the open sea rather than the shore line. -- BLE

# CORREL BIBLIOGRAPHY

SIP 22675

551.322:548.51

Edwards, G. R. and L. F. Evans  
ICE NUCLEATION BY SILVER IODIDE: II. COLLISION EFFICIENCY IN NATURAL CLOUDS. J. Meteorol. 18(6):760-765 incl. table, graphs, Dec. 1961. 6 refs.  
DLC, QC851.A283

An attempt has been made to estimate the contribution of diffusio-phoresis (the movement of aerosol particles under the influence of the gradient in water vapor pressure between a growing cloud droplet and its supersaturated environment) to the collision rate between silver-iodide nuclei and cloud droplets growing under simulated natural-cumulus-cloud conditions. The expansion chamber used is an 11.5-liter-capacity jacketed copper sphere around which a coolant is pumped from a supply tank at such a rate that, when cooling, the coolant temperature rises by less than 0.1°C in traversing the sphere. A beam of light projected through a double glass window permits visual observation of the cloud. Chamber pressure is shown by a wet test meter. Procedure, calibration, and standardization of the cold box are also described. It is shown that diffusio-phoresis has an insignificant effect on the nucleating ability of ice nuclei. The use of laboratory cold boxes to evaluate silver iodide generators may seriously overestimate the number of nuclei because, under the conditions existing in natural clouds, a large fraction of the particles in a given smoke may be too large to act as freezing nuclei yet too small to act as sublimation nuclei. Therefore, limitations have been placed on the use of silver iodide as a cloud seeding agent. -- BLE

SIP 22676

551.553(\*49:\*40)

Dickey, Woodrow W.  
A STUDY OF A TOPOGRAPHIC EFFECT ON WIND IN THE ARCTIC. J. Meteorol. 18(6):790-803 incl. tables, graph, diagrs., maps, D.C. 1961. 7 refs.  
DLC, QC851.A283

During strong wind conditions there is a pronounced topographic effect on the surface wind at the Arctic Station Barter Island, Alaska. The effect is attributable to the knob of the Brooks Range, which extends northward to the Arctic Coast in eastern Alaska and around which the air is forced to flow. It is shown that the behavior of the wind at Barter Island and along the coast to the west and east is explainable by substituting a simple physical model barrier for the knob of the Brooks Range and specifying the flow of air to be horizontal and irrotational. It is shown that the equations of motion governing the flow of air over a rotating earth may, under certain conditions, be reduced to the irrotational approximation. The distribution of pressure around the simple barrier under irrotational flow is computed and shown to conform to the observed pressure patterns over northern Alaska during strong wind situations at Barter Island. The results of the

study suggest that the explanation of wind anomalies in the Arctic and other portions of the world lies in the study of air flow around as well as over arbitrarily shaped barriers. (Author's abstract)

SIP 22677

551.322:548.51:551.510.53

Bigg, E. K., G. T. Miles and K. J. Heffernan  
STRATOSPHERIC ICE NUCLEI. J. Meteorol. 18(6):804-806 incl. illus., tables, Dec. 1961. 9 refs.  
DLC, QC851.A283

Stratospheric ice nuclei were measured in Oct. 1960, using the "Millipore" cellulose filter (SIP 21758). Balloon and aircraft flights revealed active ice nuclei at -15°C and -10°C. Sufficient altitude information was obtained to suggest a height variation. The ice nuclei could be either meteor dust or generated sulfates, without conflicting with existing evidence. By the standards of natural nuclei, the stratospheric particles are very active in ice formation and the existence of such a large reservoir of active nuclei in the upper atmosphere could be of major significance in large scale weather developments. It is also possible that some of the fluctuations in ice nucleus content at ground level in clean sites, which often appear to be unrelated to air masses, are caused by a mixing of ground levels with upper air nuclei. -- BLE

SIP 22678

551.322:548.51

Poppoff, I. G. and G. W. Sharp  
INHIBITION OF FREEZING NUCLEI BY ADSORBED CONTAMINANTS. J. Meteorol. 16(3):288-294 incl. tables, graphs, diagrs., June 1959. 17 refs.  
DLC, QC851.A283

An investigation was made of the effect of amines, ammonia, and alcohols on the nucleation of super-cooled water droplets by silver-iodide crystals. In designing the experimental apparatus, it was assumed that the interactions between nuclei and adsorbed vapors were irreversible. The carrier gas, high purity nitrogen, was passed successively through Ascarite, Drierite, and glass wool before entering the nucleus generator in order to remove carbon dioxide, water, and particulate material. Freezing nuclei were generated by heating a resistance-wire filament containing silver-iodide powder. The inhibiting vapor was obtained by bubbling a portion of the carrier gas through the liquid phase of the contaminating substance or directly from a lecture bottle. The cryostat consisted of a 300-liter-capacity home freezer lined with black velvet. It was found that the contaminants inhibit nucleation and that the vapor concentrations required for inhibition increase as droplet temperatures decrease. It was demonstrated that the adsorption of inhibitor on freezing nuclei is readily reversible and is probably physical adsorption of the Van der Waals type, rather than an irreversible chemisorption producing surface complexes. -- BLE

# CIREL BIBLIOGRAPHY

SIP 22679

551, 322:548, 51

Heffernan, K. J. and R. N. Bracewell  
COMPARISON OF FLORIDA AND CALIFORNIA  
FREEZING-NUCLEUS MEASUREMENTS, JANUARY  
1957. J. Meteorol. 16(3):337-339 incl. graphs, June  
1959. 7 refs.  
DLC, QC851, A283

Measurements of freezing-nucleus concentrations made in California and Florida during 1956 and 1957 support earlier observations that brief and intense peaks tend to occur. As the duration may be less than 24 hr, measurements taken more than once a day may allow these peaks to be more clearly delineated. Freezing-nucleus peaks tend to concur with the dates of world rainfall maxima. Further application of the technique of counting freezing nuclei seems very promising. A concerted effort in many different locations should soon settle the question of geographical extent. If the indication of world-wide simultaneity is substantiated, a planetary explanation will be needed similar to Bowen's meteoritic dust proposal. According to this proposal, the nucleating agency takes a month to sink to tropospheric levels and then has an abrupt triggering action. The present results suggest that the transmission time may vary but that the capacity to produce a sharp effect is definite. -- BLE

SIP 22680

551, 513:551, 510, 53(\*3)

Hare, F. Kenneth  
THE DISTURBED CIRCULATION OF THE ARCTIC  
STRATOSPHERE. J. Meteorol. 17(1):36-51 incl.  
graphs, maps, Feb. 1960. 29 refs.  
DLC, QC851, A283

The annual cycle of disturbed circulation in the Arctic stratosphere (i.e., areas north of the main jet-core of the Ferrel westerlies) is discussed in the light of climatological and synoptic evidence. In summer, the Ferrel westerlies and their wave-trains choke off to a zero-level near 50 mb. Because of the warmth of the Arctic stratosphere, easterly anticyclonic flow is continuous at higher levels. Cooling begins in Aug. and, by Sept., a barotropic westerly vortex, continuous with the Ferrel vortex, is established. In Oct. and Nov., this vortex becomes baroclinic and appears distinct from the Ferrel westerlies. Winter circulation has two aspects: (1) warm, barotropic, anticyclonic flow associated with a strengthening and extension of the Alaskan warm ridge, which extends to above 25 mb; and (2) cold-low development near the pole, with a marked tendency for the development of a cold trough over eastern Canada. Polar-night jet-streams and travelling baroclinic waves characterize the outer parts of the cold lows. The thermal waves associated with these disturbances often have large amplitudes and normally affect the entire stratosphere. The apparent independence of stratospheric disturbances centered above 50 mb is examined, and the probable physical and dynamical processes involved are discussed. (Author's abstract)

SIP 22681

551, 513:551, 510, 53(\*3)

Julian, Paul R.  
REMARKS ON 'THE DISTURBED CIRCULATION OF  
THE ARCTIC STRATOSPHERE.' J. Meteorol. 18  
(1):119-121 incl. graphs, maps, Feb. 1961. 8 refs.  
DLC, QC851, A283

The author's suggestion to F. K. Hare that a connection exists between the so-called primary index cycle of the Ferrel system and the breakdown of the stratospheric polar-night vortex is clarified (See SIP 22680). The course of study on the polar-night vortex breakdown phenomenon is outlined and the results and collected data are summarized. -- BLE

SIP 22682

551, 322:548, 51:551, 510, 53

Telford, J. W.  
FREEZING NUCLEI ABOVE THE TROPOPAUSE. J.  
Meteorol. 17(1):86-88 incl. tables, graphs, Feb.  
1960. 5 refs.  
DLC, QC851, A283

Flights were made near Melbourne, Australia, to study the concentration of freezing nuclei above the tropopause. All measurements were taken in cloudless air between 40,000 and 44,000 ft and below 30,000 ft. The striking feature of the measurements is the high nucleus concentration found at high altitudes. Experimental data agreed well with ground counts with which they were compared. It appears that the freezing-nucleus count above the tropopause is not significantly different from that immediately below it. The values near the tropopause are about ten times the average ground-level values. These results are most unexpected and in marked contrast to the average behavior of water vapor which decreases steadily with altitude. Therefore, either the mode of transfer of freezing nuclei in the atmosphere differs from that of water vapor or the nuclei do not all originate at the earth's surface. -- BLE

SIP 22683

551, 510, 53(\*3)

McClain, E. Paul  
THERMAL CONDITIONS IN THE ARCTIC STRATO-  
SPHERE NEAR 80W IN JANUARY. J. Meteorol.  
17(4):383-389 incl. tables, graphs, Aug. 1960. 18  
refs.  
DLC, QC851, A283

Revised means, frequency distributions and other statistics based on 10 yr of Jan. temperature observations at the 200-, 100-, and 50-mb levels are presented for 4 Arctic stations. The frequency distributions are shown to be markedly bimodal, a characteristic that becomes more pronounced with increasing height and latitude. Thermal conditions in the Arctic and Antarctic stratospheres are compared with the aid of recent RGY data. (Author's abstract)

# CRREL BIBLIOGRAPHY

SIP 22684 551.509.67:551.578.7:551.510.7

Farlow, N. H.  
ATMOSPHERIC REACTIONS OF SLURRY DROPLET  
FALLOUT. J. Meteorol. 17(4):390-399 incl. tables,  
graph, appendix, Aug. 1960. 37 refs.  
DLC, QC851.A283

The evaporation, growth, and physical properties of  
slurry fallout particles descending through the atmos-  
phere are quantitatively examined by applying estab-  
lished cloud-physics equations. An arithmetic sys-  
tem analysis is proposed and applied to radioactive  
slurry fallout particles collected at Operation RED-  
WING. Reasonable agreement between observed and  
calculated particle properties supports the validity  
of applying this method to other meteorological situa-  
tions where volatile droplet fallout may occur.  
(Author's abstract)

SIP 22685 551.322:548.51:543.2

Koenig, L. Randall  
THE CHEMICAL IDENTIFICATION OF SILVER-  
IODIDE ICE NUCLEI: A LABORATORY AND PRE-  
LIMINARY FIELD STUDY. J. Meteorol. 17(4):426-  
434 incl. illus., graphs, Aug. 1960. 12 refs.  
DLC, QC851.A283

The technique and results of the application of a  
chemical test, explicit for silver iodide, sensitive to  
a mass of  $3 \times 10^{-17}$  g to laboratory-nucleated ice  
crystals and atmospheric ice crystals from cloud-  
seeding experiments in the field are described. The  
factors involved in an identification test for silver-  
iodide ice nuclei are (1) the establishment of the loca-  
tion of the questioned particle in relation to the  
crystal structure of the crystallized phase in order  
to distinguish between washed-out matter and the true  
nucleus, and (2) the establishment of the complete  
chemical composition of the particle that lies in a  
position which suggests it has served as the nucleus  
of crystallization. Ice crystal replicas were pre-  
pared for examination by an open-faced sandwich  
technique which prevents the distortion of replicas  
with extremely thin centers. Hydrometeors were  
sampled by placing a Plexiglas tube out the pilot  
window of the sampling aircraft. In laboratory ice  
crystals, the silver-iodide nucleus was not always  
in the apparent "C" axis of the ice crystals. No  
evidence of the true role of silver iodide in cloud  
seeding was obtained. -- BLE

SIP 22686 551.322:548.51

Battan, Louis J. and James J. Riley  
ICE-CRYSTAL NUCLEI AND MARITIME AIR. J.  
Meteorol. 17(6):675-676 incl. graph, diagr., Dec.  
1960. 3 refs.  
DLC, QC851.A283

Observations were made during the summer of 1959  
on top of 8500-ft Mount Bigelow in southeastern

Arizona. In general, the nuclei concentrations on  
moist days were higher than on dry days. At vir-  
tually all temperatures, a gradual diminution of  
nuclei concentration accompanied the advection of  
dry air. The data are consistent with the hypothesis  
that the oceans may be sources of ice-crystal nuclei.  
The high moisture contents during periods of high  
nuclei concentrations, and the flow patterns, show  
that the air came from the Gulf of Mexico. -- BLE

SIP 22687 551.322:548.51

Telford, J. W.  
FREEZING NUCLEI FROM INDUSTRIAL PRO-  
CESSES. J. Meteorol. 17(6):676-679 incl. illus.,  
graph, map, Dec. 1960. 5 refs.  
DLC, QC851.A283

This paper describes a series of flight observations  
made at -24°C along the east coast of Australia near  
industrial plants in the vicinity of Sydney. The smoke  
from a steel furnace was identified as a prolific  
source of ice nuclei. However, other industries  
probably have little influence on the nucleus count;  
it is possible some may produce inhibiting agents.  
-- BLE

SIP 22688 551.524.4:551.593(\*38)

Hamilton, R. A.  
THE TEMPERATURE GRADIENT IN THE AIR  
ABOVE AN ICE SHEET. Meteorological Mag. 88  
(1040):38-43 incl. table, graph, Feb. 1959. 5 refs.  
DLC, QC851.M18

The temperature gradient was measured at screen  
level above the Greenland ice sheet during the British  
North Greenland Expedition 1952-54 by measuring the  
refractive index of the air. This method is particu-  
larly suitable for measuring temperature gradients  
over extensive flat areas where the water-vapor con-  
tent of the air is low. When the temperature-gradient  
values are plotted against time, a marked diurnal  
variation is apparent. No quantitative relation can  
be obtained between the temperature gradient and the  
air mass, but the correlation between the westerly  
component of the 700-mb wind measured near local  
noon and the temperature-gradient values is 0.51 for  
27 pairs, which is significant at the 1% level. When  
the westerly component of the surface wind is con-  
sidered, the correlation coefficient is only 0.24. The  
results indicate that the value of the departure of the  
temperature gradient from the mean value for the  
time of day depends mainly on the origin of the air  
mass and not appreciably on the screen temperature  
or wind speed. During snowfall and in cloudy condi-  
tions, the temperature-gradient values tend to be  
below normal. The significant correlation between  
temperature gradient and screen temperature in the  
evening is probably due to a high correlation between  
this temperature and the origin of the air mass. The  
data are tabulated and the amount of refraction that a  
nearly horizontal ray can undergo is estimated. --  
BLE



# CRREL BIBLIOGRAPHY

SIP 22689

551. 578. 4:551. 509. 3(41/42)

Murray, R.

SNOW IN RELATION TO CERTAIN SYNOPTIC PARAMETERS. *Meteorological Mag.* 88(1049):324-328 incl. graphs, Dec. 1959. 5 refs.  
DLC, QC851. M18

Statistics of the frequency of occurrence of snow and rain at low-lying stations (i.e., altitudes below 300 ft) over the British Isles have been re-examined to assess the probability of the precipitation being in the form of snow when certain pairs of contemporaneous parameters are known. The 1000-500 mb thickness and the surface temperature form 1 pair of parameters; the freezing level and the surface temperature form another. The treatment of the data is discussed and the probabilities are graphed. The probability of snow is high when both thickness and surface temperature are low, and it is low when both thickness and surface temperature are high. However, the snow probability tends to be high when either thickness or surface temperature is high. The results might prove helpful in forecasting. -- BLE

SIP 22690

551. 55:551. 524. 4:551. 324. 24(\*35)

Ashwell, I. Y. and F. G. Hannel

WIND AND TEMPERATURE VARIATIONS AT THE EDGE OF AN ICE-CAP. *Meteorological Mag.* 89(1050):17-24 incl. tables, graphs, Jan. 1960. 4 refs.  
DLC, QC851. M18

Fluctuations in temperature and humidity similar to those experienced in the morning and at night over the portion of the central desert which lies immediately south of the Langjökull, Iceland, ice cap are discussed. Four recording stations were used in the investigation of meteorological conditions on the ice cap. General weather conditions, "föhn wind," movements of air in contact with the south-facing slope of the ice cap, and temperature anomalies are discussed. The data show that there was a predominance of northerly winds at each station, which seems to be attributable to the frequent development by day of low pressure over the desert to the south and southeast together with the well marked katabatic draining off the ice cap during the early hours of the night. -- BLE

SIP 22691

551. 573. 7:551. 509. 54(420)

551. 578. 7:551. 577. 61:629. 13

Harrower, T. N. S. and D. C. Evans

SIMILARITIES OF THE METEOROLOGICAL SITUATIONS IN WHICH AIRCRAFT WERE DAMAGED BY HEAVY HAIL. *Meteorological Mag.* 89(1052):80-85 incl. illus., graphs, map, March 1960. 7 refs.  
DLC, QC851. M18

Attention is focused on the points of similarity in the meteorological situations in which severe damage from hail has been sustained by British European

Airways aircraft during 1954-58. The two most serious incidents were accompanied by slow-moving cold-frontal systems associated with shallow low-pressure areas, and occurred near the cold fronts which were associated with widespread thunderous activity over France. There is a similarity in the shape of the pattern of the contour lines relative to the points where the incidents occurred. A comparison of the upper-air ascents suggests that although severe hail is frequently associated with cold fronts, the degree of thermal contrast across the front does not control the size of the hailstones. These findings may help forecasters to include heavy hail in their forecasts for individual flights and SIGMET warnings, and at briefings to remind pilots of damage experienced in similar situations. -- BLE

SIP 22692

551. 524:551. 343. 7(420)

Sarson, P. B.

EXCEPTIONAL SUDDEN CHANGES OF EARTH TEMPERATURE. *Meteorological Mag.* 89(1057):201-209 incl. graphs, Aug. 1960.  
DLC, QC851. M18

Rainfall, ground-state, air-temperature, and soil-temperature data are presented which show that on at least two occasions (according to a study of earth-temperature records since 1921 in England) sudden temperature changes from one depth to another were caused by the effect of drainage of water through the soil. The necessary conditions for such changes seem to be a light sandy soil (i.e., large grains, well drained) and a large quantity of water from a thunderstorm, or sudden thaw, usually caused by heavy rains, after a prolonged cold spell. It must be possible for the water to drain away from the lower soils beforehand and, in cold weather, the upper soil must be frozen in order to retain on the surface a sufficient quantity of snow or frozen water ready for release when the thaw comes. -- BLE

SIP 22693

551. 524. 7

Jefferson, G. J.

THE USE OF 1000-500 MB THICKNESS TO DETERMINE THE FREEZING LEVEL. *Meteorological Mag.* 89(1058):222-231 incl. tables, graphs, diagra., Sept. 1960. 2 refs.  
DLC, QC851. M18

This paper shows that the readily available 1000-500 mb thickness charts can be used to determine the freezing level. Only a simple freezing level is considered with all the air below it at a temperature above 0°C. Multiple freezing levels are uncommon. The maximum and minimum possible thickness for a given freezing level, the effect of an inversion, and practical maximum and minimum thickness lines compared with observations are discussed. The relation between thickness and freezing level is calculated, and the freezing levels to be expected with

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values of 1000-500 mb thickness are tabulated. The values obtained by this method can be a useful confirmation of heights already estimated and can provide a guide over areas where even surface temperatures are not available. This method should be especially useful over areas such as oceans where soundings are sparse. -- BLE

SIP 22694

551. 578. 7(420)

Ludlum, F. H. and W. C. Macklin  
THE HORSHAM HAILSTORM OF 5 SEPTEMBER 1958.  
Meteorological Mag. 89(1059):245-251 incl. graphs, diags., maps, Oct. 1960. 1 ref.  
DLC, QC851. M18

A summary is presented of information collected about the development and nature of a severe hail- and thunderstorm which occurred near Horsham in Sussex, England. Data are presented concerning the general synoptic meteorological conditions during the first days of Sept., and observations of the height of the cloud tops and the late stages of the storm are discussed. The largest hailstones (4-8 oz), were like tennis or cricket balls, or half grapefruits. Many were dimpled on one side, like a doughnut with out a hole, while some were flattened discs. Others were irregular and even "jagged" lumps of ice. The large stones were hard and had a density near that of pure ice. One was 5 cm deep, 13 cm long, and 11 cm in diam. -- BLE

SIP 22695

551. 578. 7:629. 13

Crossley, A. F.  
HAIL IN RELATION TO THE RISK OF ENCOUNTERS IN FLIGHT. Meteorological Mag. 90(1065):101-110 incl. tables, graph, appendix, April 1961. 16 refs.  
DLC, QC851. M18

Information is presented which should aid in determining the minimum hailstone size likely to damage a supersonic aircraft in relation to existing or projected aircraft materials in ascertaining the chance of encountering hail larger than this minimum. Emphasis is laid on the forms of hail, hail-size distribution for the Denver, Colorado area, hail sizes encountered in flight by the USAF, the duration of hail falls and hail encounters in flight, the occurrence of hail in the middle latitudes and the polar and equatorial regions, and the relationship between the frequency of hail falls at the ground and thunderstorms. Supersonic aircraft should avoid large hail by using in-flight radar detection and pre-flight forecasts, and by avoiding the areas or times of day when large hail is likely to occur. A record of BOAC aircraft encounters with hail is appended. -- BLE

SIP 22696

551. 578. 7:551. 576

Crossley, A. F.  
THE FALL OF HAIL ALONGSIDE CLOUD. Meteorological Mag. 91(1075):33-39 incl. tables, Feb. 1962 5 refs.  
DLC, QC851. M18

The development and maintenance of an intense thundercloud can take place in the presence of a pronounced increase of wind with height without being appreciably deformed by shear while drifting, except in the anvil itself. Under these conditions, hail formed in the narrow funnel of strong updraft may, on reaching the upper part of the cloud, be carried sideways into the anvil and afterward fall through clear air alongside the main cloud tower. Equations are given for calculating the horizontal distance traveled by hail relative to the cloud, hail accelerated away from the cloud (first stage), and hail accelerated toward the cloud (second stage). Parameter values are chosen which yield large but not extreme displacement figures. Comparison with observations shows that the results are of the right order of magnitude. -- BLE

SIP 22697

551. 578. 45(73)

Ludlum, David M.  
SOME NOTEWORTHY SNOWS OF 1957-58. Weatherwise, 12(1):24-27, 37 incl. illus., Feb. 1959.  
DLC, QC851. W42

The major snowstorms in the U. S. during the 1957-58 winter are described. Emphasis is laid on the high frequency of heavy snowstorms in the Northeastern States; the history making storm which swept from the Gulf of Mexico up the Atlantic seaboard; two memorable storms which struck the Middle Atlantic States and New England in mid-March and left depths up to 20 in. and drifts up to 15 ft; the heaviest snowstorm since 1899 along the shore of the Gulf of Mexico; the serious blizzard conditions in South Dakota and adjoining parts of western Nebraska and Kansas in late Feb.; the record-breaking, late season Montana snow which measured up to 60 in. in some places; and the impressive totals in the Pacific Mountains. -- BLE

SIP 22698

551. 578. 45(7)

Treidl, R. A.  
THE GREAT MIDWINTER STORM OF 20-22 JANUARY 1959. Weatherwise, 12(2):45-47 incl. maps, April 1959.  
DLC, QC851. W42

A ferocious winter storm is described which caused untold suffering and left a trail of destruction across the North American continent. Intense cold existed for many weeks in the heart of the continent, piling up record depths of snow in the lee of the Great Lakes,

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especially along the southern and eastern shores of Lake Ontario. The cold wave subsequently split; the main thrust drove southward into Texas while a weak push spread a thin layer of Arctic air across the Mississippi Valley, the Ohio Valley, and the New England States. The forces in the sharply contrasting air masses were great, yet balanced. In Kansas and Nebraska, where the cold air was firmly entrenched, continuing snowfalls piled up 12 in. of snow in 24 hr. East of the Mississippi, freezing rain caused glaze nearly 1 in. thick, which resulted in tree damage and severed power and communication lines. By noon Wednesday, the 21st, blizzard conditions existed from Wisconsin to the lower Mississippi Valley, dumping 10 to 20 in. of snow near Lake Michigan. Temperature drop amounted to 30° to 40° within a few hours. The storm center accelerated up to 46 to 50 mph through southern Ontario into central northern Quebec with a central pressure down to 968 mb. When the winds died down, temperatures had dropped to sub-zero levels as far south as New Mexico and Oklahoma. -- BLE

SIP 22699

551. 578. 45(77)

Joos, Lothar A.  
THE MIDWINTER STORM IN ILLINOIS. Weatherwise, 12(2):47-48 incl. illus., April 1959.  
DLC, QC851. W42

The midwinter storm system of Jan. 20-22, 1959, exhibited greatly contrasting conditions over relatively small areas. As the principal low center formed over Arkansas on Jan. 20, and moved northeastward across southern Illinois, areas near the Ohio River had heavy rains, thunder, southerly winds, and temperature above 60°F. At the same time some of the northwestern counties were experiencing readings near 20°F, heavy snow, and northeasterly winds. Icing conditions were worst in central Illinois. Northern parts of Illinois received 8 to 12 in. of snow with strong drifting winds which closed highways as fast as snowplows cleared them. While heavy snow was troubling northern regions, extreme southeastern Illinois received 2 to 4 in. of rain on frozen topsoil. Heavy glazing continued for 10 to 20 hr in the central third of the state; 2 to 5 in. of snow, sleet, and ice covered the ground. The ice weight broke tree branches of all sizes and downed a number of overhead wires but the bulk of the extensive damage to power and communications lines was caused by broken tree limbs falling across the cables. -- BLE

SIP 22700

551. 578. 4:551. 509. 54(79)

Quiroz, Roderick S.  
RECORD SNOWFALL IN SUNNY SOUTHERN ARIZONA. Weatherwise, 12(2):49-50 incl. illus., table, April 1959. 2 refs.  
DLC, QC851. W42

During the second half of 1958, the normally quiet weather of southern Arizona was disrupted by two

record-breaking events: a 4-in. rainfall on July 29, and a 6-in. snowfall on Nov. 16, both at Tucson. The snowfall fell a most of the state but the resulting damage was not exceptionally large. Synoptically, the 500-mb upper-air pattern is more consistently associated with widespread snow in this area than the surface-pressure pattern and therefore more useful as a predictor. All situations which resulted in more than a trace of snowfall at Tucson during 1949-58 showed features in common at the 500-mb level. To determine whether this is a "sufficient" antecedent condition for snowfall, 5 sets of daily 500-mb maps were prepared for the winter months and compared with snowfall dates. The results suggest that other factors must be taken into consideration. -- BLE

SIP 22701

551. 578. 45(73)

Ludlum, David M.  
SOME NOTEWORTHY SNOWS OF 1958-59. Weatherwise, 13(1):26-29, 39-40 incl. illus., map, Feb. 1960.  
DLC, QC851. W42

Noteworthy snows in the U. S. during 1958-59 are discussed. Emphasized are the New England snow season (which had only 1 major storm); the hard winter in New York State (which included a snowburst of 51 in. in 16 hr at Bennett's Bridge, east of Lake Ontario); the Dec. snowbursts along the Great Lakes (Dec. 1958 ranked with the coldest Decembers on record in northern sections); heavy Carolina snowstorms; snowbound Wisconsin (accompanied by the coldest winter the upper Mississippi Valley has experienced since the record-breaker of 1935-36); the snow season in the Rockies (which included several heavy snows and phone and power failures in south-central Montana); and the Pacific slope (which had below normal precipitation). -- BLE

SIP 22702

551. 578. 45(73)

Ludlum, David M.  
THE GREAT EARLY MARCH SNOWSTORM OF 1960. Weatherwise, 13(2):59-62, 73 incl. maps, April 1960.  
DLC, QC851. W42

One of the great snowstorms of modern times staggered southeastern New England on March 3-5, 1960. At sea level along Boston Harbor, 19 in. of new snow was measured which exceeds by 2 in. the former record (1872-1960) for a single Boston storm. The establishment of a core of cold air over northern New England and the Maritime Provinces played an important role in the development of storms in the Gulf of Mexico, Kentucky, and New York City (14.2 in. of snow in about 26 hr for the heaviest fall since the 16.7 in. on Dec. 19-20, 1948). More snow fell over parts of eastern and southeastern Massachusetts than during any other storm on record in those areas. -- BLE

# CRREL BIBLIOGRAPHY

SIP 22703

551. 326. 12(\*61)

[G. A. T.]

DISTRIBUTION OF NORTH AMERICAN AND GREENLAND ICE AT THE END OF JUNE 1959. Marine Observer, 29(186):196-197 incl. map, Oct. 1959.

DLC, QC851. M127

Ice conditions in sea areas around North America and Greenland at the end of June 1959, are discussed. The occurrence and distribution of ice floes and icebergs are mapped. -- BLE

SIP 22704

551. 326. 12(\*61)

[G. A. T.]

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN. Marine Observer, 30(187):32-35 incl. maps, Jan. 1960.

DLC, QC851. M127

Data are presented concerning relevant weather factors and sea-ice conditions and distribution for the end of July, the end of Aug., and the end of Sept. 1959, for Baffin Bay, Davis Strait, and the Canadian Archipelago; Hudson Bay, Hudson Strait, and Foxe Basin; and off eastern Greenland. -- BLE

SIP 22705

551. 326. 12(\*61)

[G. A. T.]

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN. Marine Observer, 30(188):90-95 incl. tables, maps, April 1960.

DLC, QC851. M127

Data are presented concerning relevant weather factors, sea-ice conditions and distribution, and icebergs for the end of Oct., the end of Nov., and the end of Dec. 1959, for Baffin Bay, Davis Strait, and Hudson Bay; the St. Lawrence River, the Gulf of St. Lawrence, and Grand Banks; eastern Greenland, and the Baltic Sea. -- BLE

SIP 22706

551. 326. 12(\*61)

[G. A. T.]

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN. Marine Observer, 30(189):150-156 incl. tables, maps, July 1960.

DLC, QC851. M127

Data are presented concerning relevant weather factors, sea-ice conditions and distribution, and icebergs for the end of Jan., the end of Feb., and the end of March 1960, for Baffin Bay, Davis Strait and the Canadian Archipelago; eastern Greenland;

Spitsbergen, Beer Island, and areas north of Iceland; Grand Banks; the Gulf of St. Lawrence and the St. Lawrence River; and the Baltic Sea. -- BLE

SIP 22707

551. 326. 12(\*61)

[G. A. T.]

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM APRIL TO JUNE 1960. Marine Observer, 30(190):214-217 incl. tables, map, Oct. 1960.

DLC, QC851. M127

Data are presented concerning relevant weather factors, sea-ice conditions and distribution, and icebergs for Baffin Bay and Davis Strait; eastern Greenland, Spitsbergen, Beer Island, and areas north of Iceland; Grand Banks and the Belle Isle Strait; and the Baltic Sea. -- BLE

SIP 22708

551. 578. 7:551. 501. 81(\*41)

Douglas, R. H. and W. Hitschfeld

PATTERNS OF HAILSTORMS IN ALBERTA. Quart. J. Roy. Meteorol. Soc. 85(364):105-119 incl. table, graphs, diagrs., map, April 1959. 8 refs.

DLC, QC851. R8

Between June 14 and Sept. 20, 1957, nearly 3200 surface reports of hail were collected in a 15,000-mi<sup>2</sup> area. Information included location, time and duration of hail and the largest size of hail encountered. Continuous radar records of the storm pattern were made for the preparation of constant-altitude radar weather (CAPI) maps, for a 100-mi range. At times, hail fell soon after a first echo (possibly within 10 min); sometimes no hail occurred for as long as 1 or 2 hr. Usually, the hail fell in short bursts (lasting up to 20 min and spread over a few miles) which would appear to be the products of single storm cells. But on several occasions (notably on July 23) hail fell continuously for 1-1/2 hr and, without multiplicity of cells, covered a strip 30 mi long. Sustained hail came from storms whose echo tops were steady close to 30,000 ft above the surface. Hail associated with echoes of lesser height was not continuous and tended to fall in bursts which sometimes followed closely the merger of previously separate storms. A study of 83 independent echoes showed that the probability of hail from a given storm was clearly related to the maximum height of the storm, rising from zero for storms 10,000 ft or lower, to 100% for storms 38,000 ft or more. A similar correlation exists between the echo height of a hailstorm at a given time and hail arrival at the ground minutes later. (Authors' abstract, modified)

# CRRRL BIBLIOGRAPHY

SIP 22709

551. 542. 1:551. 588. 5(\*38)

Hamilton, R. A.  
THE PRESSURE GRADIENT AT THE EDGE OF AN ICE SHEET. Quart. J. Roy. Meteorol. Soc. 85 (364):166-167, April 1959. 3 refs.  
DLC, QC851. R8

Mean sea-level pressures on the northeast coast of Greenland are compared with those of a low-level station within the edge of the inland ice. During 1952-54, pressure readings were taken simultaneously at Britannia S6 (77°09'N, 23°36'W, alt. 229 m) and at Danmarkshavn (135 km distant). The comparison indicates there is no evidence of an unusually high pressure gradient near the ice edge. (Author's abstract, modified)

SIP 22710

551. 543. 1(\*38)

Hamilton, R. A.  
THE DIURNAL VARIATION OF PRESSURE ON THE GREENLAND ICE SHEET. Quart. J. Roy. Meteorol. Soc. 85(364):168-170 incl. graph, April 1959. 5 refs.  
DLC, QC851. R8

This paper discusses causes of barometer-reading errors, describes barograph observations made from June to Dec. 1953, at "Northice" on the Greenland ice sheet, and presents diurnal pressure-variation curves for "Northice" and "Eismitte." The data for the latter were obtained by Holzapfel, Kopp, and Wegener in 1939. The diurnal pressure-variation curve at "Northice" shows a marked minimum in summer and autumn at about 0430 GMT. Maxima occur at 1300 and 2100 GMT separated by a subsidiary minimum at 1730 GMT. The diurnal pressure-variation range is 0.3 mb. -- BLE

SIP 22711

551. 524:551. 543(\*7)

Wexler, H.  
SEASONAL AND OTHER TEMPERATURE CHANGES IN THE ANTARCTIC ATMOSPHERE. Quart. J. Roy. Meteorol. Soc. 85(365):196-208 incl. tables, graphs, maps, July 1959. 16 refs.  
DLC, QC851. R8

The annual temperature variation in Antarctica is 50° to 60°C in the stratosphere, 20° to 40°C at the surface, and 10°C in the troposphere. During the winter night, the troposphere temperature decreases slightly while the stratosphere temperature drops about 1/4°C per day. This differential cooling, which weakens and at times wipes out the tropopause, is caused by intense horizontal advection of maritime air into the Antarctic troposphere and by very little advection through the strong stratospheric jet stream encircling Antarctica. This ventilation of the Antarctic troposphere by warm marine air causes large portions of Antarctica to exhibit the "kernlose" winter-temperature curve instead of the sharp winter

minimum usually found in polar continental climates. Large deviations in average monthly temperatures are found in the Ross Sea area which are a reflection of large annual circulation changes in that area. After the winter solstice, the Antarctic stratosphere continues to cool until the sun returns and then warms as much as 50°C/mo. The Arctic stratosphere warms 30° to 40°C, sometimes beginning 6 weeks before the sun returns. A secular trend of temperature since 1912 to +2.6°C at Little America compares with +8.2°C trend at Spitsbergen. Temperature and outgoing radiation observations at the South Pole I. G. Y. Station during the cold period of April 19-24, 1958, are presented to illustrate quantitatively the effect of warm cloud radiation on surface-air temperature and its vertical gradient. (Author's abstract, modified)

SIP 22712

551. 33:551. 583. 7(410)

Manley, Gordon  
THE LATE-GLACIAL CLIMATE OF THE LAKE DISTRICT. Weather, 17(2):60-64 incl. illus., Feb. 1962. 9 refs.  
DLC, QC851. W4

The limits of the valley head glaciers, snowlines, and the date of the latest episode of glaciation in Lake District, Eng., are estimated. In Mickleden, morainic evidence suggests that the ice came down to a snout at about 400 ft. For the Borrowdale glacier which descended to Seathwaite, the snowline was at 1500 ft. In the Helvellyn range, the Rydal glacier descended to 850 ft and possessed a snowline at 1800 ft. Cirque glaciers existed north of Mts. Skiddaw and Saddleback in shaded places backed by a wide area of upland plateau surface. These glaciers lay at an average altitude of 1600 ft in the district areas where the present annual precipitation exceeds 130 in., 2000 ft where the average is 100 in., and 2400 ft where it is 70 in. Hence, the annual precipitation was much the same, both in quantity and distribution, as it is today. Present evidence also suggests that a change occurred during the ninth millennium B. C. in the atmospheric-circulation pattern similar to that of the present. At that time, however, Britain was still joined to the continent and the North Atlantic was still decidedly cold. The change must have been dominant for several decades. -- BLE

SIP 22713

551. 32:551. 5:91(08)(494)

George, D. J.  
THE GORNERGLETSCHER GLACIOLOGICAL EXPEDITION, 1959-60. Weather, 17(5):162-167 incl. illus., graph, maps, May 1962. 1 ref.  
DLC, QC851. W4

The aim of the expedition was to obtain as complete a picture as possible of the mechanics of a typical Alpine glacier over a 1-yr period, and to correlate variations in velocity or strain rates with seasonal weather changes. The combined glaciological and

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meteorological program included observations of glacial velocities, measurements of principal strain rates, snow accumulation, snow density, ablation, firn compression and snow creep at stations from the head of the Gorner Glacier to the snout, with special investigations of thrust planes at the snout. Meteorological stations, set up near the base hut and on the medial moraine, included Stevenson screens, rain gauges, thermocouples at various depths, and humidity- and wind-profile masts. A marked diurnal variation in the height of cumulus base was observed, and during the last week of May, an anticyclone persisted over France, so that a northerly airstream flowed over the Alps giving favorable conditions for lee-wave clouds. Attempts to obtain replicas of snow crystals, using polyvinyl formal dissolved in ethylene dichloride as described by Schaefer (1942), were unsuccessful because the temperatures were between 10 and -2°C. The crystals partly melted before the solvent had evaporated. -- BLE

SIP 22714 551.32:551.5(\*464.4)

Havens, James M.  
SUMMER WEATHER OBSERVATIONS ON A CANADIAN ARCTIC ICE CAP. Weather, 17(6):197-209 incl. illus., tables, graphs, diagr., map, June 1962. 21 refs.  
DLC, QC851. W4

Two meteorological stations operated on Axel Heiberg Island, N.W.T., Can., during the 1960 summer: "Upper Ice Station," in the accumulation zone of Akaitoa Ice Cap, and "Lower Ice Station," in the ablation zone of White Glacier. The observations were supplemented by a general program at the Jacobsen-McGill Arctic Research Expedition's base camp on ice-free ground near the island's fiorded west coast. Results of the investigations made at "Upper Ice" from May 29 to Aug. 28, 1960, are outlined. They include meteorological observations, glaciological work, glacial-meteorology (the subjects concerning the relation between a glaciological process and meteorological or climatological influences), radiation, micrometeorology, and ablation. The relationships between meteorology and glaciology are diagrammed through consideration of the mass balance of a glacier. -- BLE

SIP 22715 551.596:599.9:551.571:612.562(410)

Howe, G. Melvyn  
WINDCHILL, ABSOLUTE HUMIDITY AND THE COLD SPELL OF CHRISTMAS 1961. Weather, 17(11):349-356 incl. graphs, maps, Nov. 1962. 9 refs.  
DLC, QC851. W4

The origin of the term "windchill" and formulas for determining it are summarized (See SIP 21650), the distribution of mean windchill in Britain for the period 1956-61 is mapped and discussed, and abso-

lute humidity is correlated with occurrence and severity of bronchial diseases. During the 1961 Christmas period (one of the coldest on record in Britain), the Thames was ice-covered at Shillingford and Reading for a period; the Severn froze from bank to bank at Shrewbury; the Avon froze for the first time in 70 yr at Bath; enormous utility and communication damage and sickness were suffered, and windchill values were high (they compared with the mean windchill values for the coldest month of the year at such places as Leningrad, Krasnoyarsk, Peking, St. John's (Newfoundland), and Calgary (Can.)). The concept is supported that deaths from respiratory diseases increase with a decrease in absolute humidity. -- BLE

SIP 22716 551.501.9:551.506(\*772)

Morris, Wesley R. and Norman L. Peters  
INSIDE ANTARCTICA NO. 5--BYRD STATION. Weatherwise, 13(4):162-165 incl. illus., tables, Aug. 1960.  
DLC, QC851. W42

Byrd Station, the second U. S. post established for the U. S. -IGY program in Antarctica was established and supplied primarily by huge tractor trains operating from Little America V, over 600 mi away on the Ross Ice Shelf. One reason for the choice of the location was to investigate the puzzling atmospheric pressure surges which occur in West Antarctica. The relatively flat snow surface upon which the camp rests is the top of an 8000-ft-thick ice layer, although the camp is only 5000 ft above sea level. Because of relatively strong winds and frequent blizzards, drifting and snow accumulation created additional problems for the meteorological program which began operation in 1957. Surface observational data for the first 3 yr are tabulated. Winds at Byrd Station, prevailing from the north to northeast, average 15 knots and reach gale force in nearly every month. At times katabatic flow occurs; it was particularly apparent during the 1958 winter. -- BLE

SIP 22717 551.515:551.574.42(76)

Williams, Baker B.  
THE 1960 ICE STORM IN NORTHERN ALABAMA. Weatherwise, 13(5):196-199, 203 incl. illus., graph, maps, Oct. 1960.  
DLC, QC851. W42

The synoptic situation is described of an unusual ice storm which occurred in north central and northeastern Alabama on March 2, 1960. The storm occurred in a major storm system which brought into the area a combination of abundant precipitation and air temperatures just above freezing in valleys (where no icing occurred) and just below freezing over the ridges. As trees became encased in a thick

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ice shell with long icicles, they bent, split, and snapped with the resounding crack of a shotgun. Roads were blocked by ice, trees, and wires. Damages in Alabama to timber, buildings, equipment, utilities, poultry, hogs, cattle, and the dairy industry were near \$30 million. -- BLE

SIP 22718

551. 33:59

An der Lan, H.  
ANIMALS IN PERENNIAL SNOW AREAS. (Tiere im Ewigschneegebiet; Text in German). Umschau, 63 (2):49-52 incl. illus., graphs, Jan. 15, 1963. 15 refs.  
DLC, AP30. U5

This paper discusses the occurrence, source of nourishment, and other characteristics of organisms which live in perennial snow and ice in polar and high mountain regions. The most common organism is the glacier flea (*Isotoma saltans* Nic.) which is often so numerous that the snow appears to be covered by rust. Nourishment is obtained from plant detritus and pollen found in cryoconites. The "living quarters" of the glacier flea is the snow-ice transition area immediately below the surface. According to laboratory experiments, from 0° to -19°C various critical values appear which cause the organism to become immobile. The optimum temperature range is 0° to -4°C. Temperature curves are presented for snow and ice in the Hintereisferner at 2520- and 2820-m elevation. Remains of pre-ice age organisms found on high mountain peaks are also discussed. -- BLE

SIP 22719

621-496:6:3. 139:551. 322

Shibel, F. C., C. S. Grove, Jr. and A. R. Aldun  
DEVELOPMENT OF INSULATING AQUEOUS FOAMS FOR PROTECTION OF ICE SURFACES. Rept. No. OA-R4-FR 110162, Onordaga Associates, Incorporated, 65p. incl. illus., tables, graphs, diagrs., appendix, Nov. 1962. 2 refs.  
DLC, Tech. Rept. Collection

Methods were investigated of protecting ice runways in the Arctic regions during the summer months when melting or thawing can cause soft spots or "pot holes." Many insulating materials are available, but the difficulties of application and transportation and the resultant increase in cost preclude their use. A proprietary concept utilizing aqueous foam insulation has many advantages including ease of application and no need for removal. The stability, insulating and generation properties of the foam were studied in detail in both small and large scale laboratory tests. Arctic field testing substantiated these findings and proved the use of aqueous foam to be both feasible and promising. (Author's abstract, modified)

SIP 22720

551. 336(\*881)

Hoffman, C. R. and N. S. Stehle  
SEA ICE STUDIES ON MCMURDO SOUND DURING DEEP FREEZE 62. Tech. Note N-494, U. S. Naval Civil Eng. Lab., [20]p. incl. tables, graphs, appendix, June 1963. 4 refs.  
DLC, Tech. Rept. Collection

Preliminary to a study of ice thickening techniques for Antarctica, an investigation of the thickness, density, and salinity of sea ice of various ages was conducted in McMurdo Sound during the summer of 1962. Site selection, weather, sampling methods, equipment, and procedure are discussed. During the sampling period, the 1- and 3-yr ice decreased in thickness about 3 ft on the bottom; no loss occurred in the older 30-ft-thick ice. The sampling interval of 4 to 5 weeks at 3- to 5-ft depth intervals was too great to permit the development of summer trends in salinity, density, and strength. Because of the lack of knowledge about the characteristics of Antarctic sea ice, further sampling of natural and flood-produced ice in McMurdo Sound are planned. (Authors' abstract, modified)

SIP 22721

551. 321. 2:622. 26(\*772)

Terry, C. W.  
BYRD STATION SNOW TUNNELS - WALL CLEARING STUDY. Tech. Note N-510, U. S. Naval Civil Eng. Lab., 9p. incl. graph, April 1963. 5 refs.  
DLC, Tech. Rept. Collection

Present data on the closure rates in most of the tunnels at New Byrd Station, Antarctica, indicate that trimming of the walls to maintain desirable clearances will not be required before Deep Freeze 1965. A review of the Byrd Station drawings showed that about 75% of the tunnel wall surfaces will allow a relatively high degree of mechanization for economical wall trimming. Buildings and other obstructions will necessitate hand clearing in the remaining 25%. On a basis of tunnel clearing work at Camp Century, Greenland, tentative methods and equipment for trimming walls and disposing of the waste snow are selected for Byrd Station. It is concluded that specific rates of closure and maximum allowable safe closures for the Byrd tunnels should be established at an early date. Also, precise techniques and equipment should be determined for each different tunnel situation during Deep Freeze 1964. (Author's abstract)

SIP 22722

551. 324:550. 3

Kamb, Barclay  
GLACIER GEOPHYSICS. Science, 146(3642):353-365 incl. illus., graphs, diagrs., Oct. 16, 1964. 50 refs.  
DLC, Q1. 835

# CRREL BIBLIOGRAPHY

Glacier geophysics aims to provide a quantitative connection between climatic change and glacier fluctuation, so that glaciers can be interpreted confidently as long-term monitors of climate. By studying how the striking structures originate in glaciers from glacier flow, which are analogs of structure in certain metamorphic rocks from which great deformations of the earth's crust have been inferred, a better understanding of deep and fundamental earth processes can be obtained. This article summarizes recent ideas and measurements bearing on the glacier flow process, its expression in the dynamic response of glaciers, and the possibility of using these concepts to increase the understanding of solid deformation processes in the earth generally. Emphasis is placed on ice properties, basal slip, thermal regimes and the flow of ice sheets, and glacier waves. Examples and data are presented from the U. S., Canada, Greenland, Antarctica, Norway, and Switzerland. -- BLE

SIP 22723

551.46.062.5(\*826)

Lusquinos, Andres Jorge.  
EXTREME TEMPERATURES IN THE WEDDELL SEA. Bergen, Norway. Univ. Årbok Mat.-Nat. Ser., No. 23, 19p., incl. table, graphs, diagr., maps, appendix, 1963. 11 refs.  
DLC, Unbound periodical

Sea-water temperatures below the freezing point were measured at depths between 200 and 1000 m near General Belgrano and Ellsworth Stations. Convection in the shelf areas may reach the bottom and the water thus formed is assumed to be no colder than the freezing point corresponding to the salinity of the surface water (as a rule, above  $-1.90^{\circ}\text{C}$ ). But readings have been below this point ( $-2.08^{\circ}\text{C}$ ). Water in contact with the underside of the shelf ice will be kept at its freezing point, but the temperature may be reduced to values lower than the freezing point at atmospheric pressure. If the depression of the freezing point of sea water with pressure is of the same order of magnitude as that of pure water (about  $0.0075^{\circ}\text{C}/\text{atm}$ , or  $0.075^{\circ}\text{C}/100\text{ m}$  depth), the water near the shelf ice may be cooled at subsurface depths to temperatures as low as, or even lower than, those reported, without being supercooled. The low temperature readings are concentrated over a limited area, due possibly to the fact that a long deep trough in the sea floor extends under the Filchner Ice Shelf from the Ellsworth area and 300 km southward and sea water cooled under the ice covering the trough will be concentrated at the mouth of the trough before mixture with the open sea. This implies that low temperature areas may be expected wherever glaciers are flowing into the sea, depending on local factors affecting cooling and concentration. Data are included in the appendix. -- MFG

SIP 22724

551.46(\*826)

Klepikov, V. V.  
HYDROLOGY OF THE WEDDELL SEA. (Gidrologiya moria Ueddella; Text in Russian. Trudy, Sovet. Antarkicheskaya Eksped., 17:45-93, incl. tables, graphs, maps, 1963. 55 refs.  
DLC, G860.563

A summary is given of the history of voyages and research, and of ice conditions in the Weddell Sea. The basic reason for the ice cover and subsequent year-round inaccessibility of the western part of the sea is the combination of the configuration of its shores, the presence of the large dry area of the Antarctic Peninsula, and the system of surface currents. Features of the basic types of ice, i.e., pack ice, fast ice, tabular icebergs and floes, include seasonal changes, surface currents, cyclonic circulation, and the tidal currents from the east which circumvent the entire sea, causing thinning out, compression, and shifting of the ice. Circulation, temperature, and salinity of surface and deep waters are discussed, in relation to the development of shelf topography. Similarities of the ice conditions, surface water, and the distribution and characteristics of warm deep waters suggest an interrelationship between Arctic waters and the Weddell Sea. -- SKM

SIP 22725

528.9(\*722.5)

McHugo, M. Barbara  
THE MAPPING OF BRITISH ANTARCTIC TERRITORY. Brit. Antarctic Survey Bull., No. 4:13-14. Incl. map, Sept. 1964.  
DLC, GPRR

In May 1964, the Directorate of Overseas Surveys published the new Index (D. O. S. (Misc.) 101) [included in this paper] to British map coverage of British Antarctic Territory, South Georgia and the South Sandwich Islands. A list of map sheets published in the past year is described, including those compiled from the Commonwealth Trans-Antarctic Expedition (1:200,000 scale) as well as coverage of Graham Land (1:200,000) between  $68^{\circ}$  and  $70^{\circ}\text{S}$ , incorporating determinations made by surveyors working from Stonington Island between 1957-61. Also available are a colored relief map of Graham Land, South Georgia and South Sandwich Islands (1:3,000,000) (D. O. S. 813), an official British map of Antarctica (D. O. S. (Misc.) 135) based on material available March 31, 1963 and contour maps (1:25,000) of Deception Island, Hope Bay and Horseshoe Island. A short history of British Antarctic mapping is included. -- MFG



# CRREL BIBLIOGRAPHY

SIP 22726

551. 32(082. 3)

Bentley, Charles R. and John C. Behrendt  
GLACIOLOGY. Science, 142(3590):415-416, Oct.  
18, 1963.  
DLC, Q1. S35

IGY glaciology findings were reviewed at a symposium (Aug. 12-16, 1963) at the University of California, Los Angeles. The number of retreating glaciers decreased since 1950, and advance occurred in some areas. A net increase in total mass of ice is suggested. Snow stratigraphy studies show an increasing accumulation rate over the last 200 yr, but precipitation rates are below average since 1930. Climatic warming over the last few centuries is shown by decreasing temperature with depth in the polar ice. Radiation, rather than heat transfer, is seen to have more effect on glaciers. For several glaciers in balance the ratio of accumulation area to ablation area is nearly the same; the net budget gradient in both these zones tends to remain constant as the equilibrium line shifts position, and further, it differs little among glaciers within the same region, suggesting that aerial photography and quantitative budget estimates of a few glaciers may provide a method of estimating the condition of many glaciers. Theories on ice flow and deformation, heat flow in ice sheets, and densification of ice have shown success. A present program employing a thermal coring device should produce a useful stratigraphic record of earlier conditions. The difficulties of recording clear seismic echoes in the high interior plateaus were emphasized. Widespread evidence from West Antarctica of a relatively low seismic wave velocity in the basal few hundred meters of ice might indicate a disseminated rock load; this would aid in the understanding of erosion and transport by continental ice sheets. -- MFG

SIP 22727

551. 322:536. 421. 1

Fischer, W. H. and C. Robert Perdue  
SHOCK-INDUCED FREEZING OF "ACTIVATED"  
SUPERCOOLED WATER. Nature, 204(4960):764-  
765 incl. tables, graphs, Nov. 21, 1964. 3 refs.  
DLC, Q1. N2

The effect of the mercury-bulb "activation" of water on shock-induced freezing was investigated. The shock-tube was maintained at -10°C, the 0.5-cm<sup>3</sup> samples were held in glass tubes, and a 1.1 lb/in.<sup>2</sup> over-pressure shock wave, lasting 2 msec, was administered by bursting a "Cellophane" diaphragm with 15 lb/in.<sup>2</sup> air pressure. Deionized, blank, and "activated" water samples were tested. An analysis of the number of blank and "activated" samples affected by shock indicates that "activation" has a greater effect than agitation alone. The experimental results are tabulated and graphed. -- BLE

SIP 22728

551. 322:536. 421. 1

Ubbelohde, A. R.  
MELTING AND FREEZING. Nature, 204(4963):  
1046-1049 incl. table, diagrs., Dec. 12, 1964. 14  
refs.  
DLC, Q1. N2

Many problems concerning melting and freezing can be regarded as structural and statistical developments of the Boltzmann expression for the entropy of fusion,  $S_f$ . Although some authors have postulated that there is no discontinuous increase of entropy upon passing from the solid to the liquid state,  $S_f$  is positive for all cases of melting so far investigated. Statistical interpretation of this conclusion needs to be linked with knowledge about the structure of the liquid and solid phases. One outcome of modern investigations of melting is primarily to clarify concepts and conclusions about the structure of the liquid state near the freezing point. A direct outcome of the Boltzmann equation is the recognition that the increase of entropy during melting involves an increase of positional disorder. Aspects of a melting theory by Lennard Jones and Devonshire which are suggestive for modern developments are discussed. In this theory and similar ones, the melt is treated as a highly defective crystal and is described as "quasi-crystalline." Some thermodynamic and structural considerations of consequences of cluster formation are discussed which are a departure from quasi-crystalline structure of the melts. The role of pre-freezing anomalies in the statistical thermodynamics of melting is outlined. -- BLE

SIP 22729

551. 578. 46:551. 322:539. 3:551. 1

Körner, H.  
SNOW AND ICE MECHANICS AND SOME OF ITS  
RELATIONSHIPS TO GEOLOGY. (Schnee- und  
Eismechanik und einige ihrer Beziehungen zur  
Geologie; Text in German with English abstract).  
Felsmechanik und Ingenieurgeologie, 2(1):45-67 incl.  
illus., graphs, diagrs., maps, 1964. 33 refs.  
DLC, TA704. G4

Snow, névé, and ice are classified as stones; therefore, glaciology is a section of geology. Snow and ice mechanics, like soil mechanics, consists of an experimental branch which inquires into the physical-mechanical nature of snow and ice, and a theoretical-practical branch which treats all problems connected with the deformation and breaking of ice bodies (avalanches, glaciers, ice caps, and shelf ice). Improvements are summarized in the field of experimental ice mechanics during the last 10 yr. Efforts were made especially to find the laws by which ice flow is determined and to analyze those changes occurring in the crystalline structure of ice samples during mechanical deformation. In the field of theoretical ice mechanics, the theory of plasticity is applied to explain the motions of an ideal valley glacier and to show some practical consequences (glacial erosion) that are of interest for geology.

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Attention is also focused on the study of Antarctic shelf ice by American scientists to explain the formation of fold structures in ice (synclines and anticlines). The question arises whether fold formations of shelf ice mirror corresponding tectonic changes of the earth's crust. (Author's abstract, modified)

SIP 22730

693.547.3(\*50)

Tokmakova, I. A.  
USE OF MORTAR AND CONCRETE WITH POTASH ADDITIVES FOR WINTER CONSTRUCTION. (Primenenie rastvorov i betonov s dobarkoi potasha pri proizvodstve stroitel'nykh rabot v zimnee vremia; Text in Russian). Moscow, Gos. Izd-vo lit-ry po stroitel'stvu, arkhitekture i stroitel'nym materialam, 83p. incl. illus., tables, graphs, diagrs., 1963. 21 refs.

DLC, TH461. T6

Methods are described for preparing mortar and concrete with potash additives in the laboratory and out of doors, and examples are given for their winter use. Emphasis is placed on the construction of concrete walls. These mixtures are physically and mechanically superior to ordinary mortar and concrete. Potash additives result in thorough hardening in freezing weather, the preclusion of discoloration and salting out, an improvement of adhesion to old concrete and fixtures (thereby eliminating corrosion), and an increase in durability. -- VDP/BLE

SIP 22731

551.5:551.32(\*464.2)

Lotz, J. and R. B. Sagar  
METEOROLOGICAL WORK IN NORTHERN ELLESMERE ISLAND, 1957-60. Weather, 15(12): 397-406, incl. illus., tables, map, Dec. 1960. 16 refs.

DLC, QC851. W4

This paper discusses the history of expeditions to northern Ellesmere Island, Can., which began in 1876, and meteorological and glaciological observations, with emphasis on work concentrated at the Gilman Glacier camp during 1957-60. Attention is focused on standard synoptic observations, micro-meteorological work, radiation studies, ablation on the Gilman Glacier, and ice conditions on Lake Hazen. -- BLE

SIP 22732

629.113:624.148.7

Chernov, S. A. and I. A. I. Kuvshinov  
USE OF TRACTORS AND AUTOMOBILES UNDER WINTER CONDITIONS. (Ekspluatatsiia traktorov i avtomobilei v zimnikh usloviakh; Text in Russian). Moscow, Izd-vo Ministerstva sel'skogo khoziaistva RSFSR, 1963, 79p. incl. tables, graphs, diagrs.

DLC, Slavic Div.

Cold weather decreases the efficiency and increases the fuel consumption of motors. Suggestions are given regarding the temperature at which water and oil should be maintained in motors and the cold-weather maintenance of tractors and motor vehicles. During operation, stops should be few and short. Techniques and devices are described for facilitating the loading and unloading of goods such as the use of trailer sleds. Tractor and motor-vehicle engines are warmed by pouring hot water or antifreeze into the cooling system, using the exhaust heat from the starter motor (for tractors), or external heaters. Cooling, fuel, and hydraulic systems, and batteries must be carefully checked, and lubricants must be prewarmed or diluted. Driver-cabin heating systems and methods of increasing mobility on snow and ice are described. -- VDP/BLE

SIP 22733

551.524.2(1/9)

George, D. J.  
THE COLDEST PLACE ON EARTH. Weather, 16(5):144-150 incl. graphs, maps, May 1961. 11 refs.  
DLC, QC851. W4

The lowest temperatures measured in different parts of the world are summarized with emphasis on Antarctica. In Asia temperatures have been measured as low as -68°C at Verkhoyansk in northeast Siberia (Feb. 5 and 7, 1892), -66°C in Greenland at the "Northice" station of the British North Greenland Expedition (Jan. 9, 1954), and -62.8°C at Snag, Yukon Territory, Canada (Feb. 3, 1947). At the Amundsen-Scott IGY station at the South Pole (alt. 2800 m), -73.5°C was measured May 11, 1957, and -74.5°C Sept. 17, 1957. At the Vostok IGY station (the coldest place on earth), -80.7°C was measured June 15, 1958, -85.5°C Aug. 7, 1958, -87.4°C Aug. 25, 1958, and -88.3°C Aug. 24, 1960. Wintering-over conditions in the interior of the Antarctic are described. Monthly extreme temperatures during 1957 and mean monthly temperatures (Jan. 1957 to Aug. 1960) for the Amundsen-Scott station and a comparison of mean monthly temperatures at Vostok and Verkhoyansk are graphed. Mean isotherms for Antarctica for Jan. and July, and mean annual isotherms are mapped. The lowest upper-air temperatures so far measured were also found over the Antarctic; -97°C was measured 20 mb (24,000 m) above Halley Bay on Aug. 9, 1959. -- BLE

SIP 22734

551.578.7(420)

Ludlam, F. H.  
THE HAILSTORM. Weather, 16(5):152-162 incl. illus., table, diagr., May 1961.  
DLC, QC851. W4

The paper discusses hailstorms, cumulonimbus clouds, radar analysis, and the size and composition of hailstones, based on investigations made in England. Emphasis is placed on theories of hailstone

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growth, an improved cumulonimbus model, hail growth within the model cumulonimbus, hailstone embryos, and hail prevention. Excellent color photographs of cumulonimbus clouds are presented, typical conditions inside a severe storm cloud are tabulated, and air flow within a vertical section through a typical severe hailstorm is diagramed. -- BLE

SIP 22735

551. 578. 41:930. 24

Needham, Joseph and Lu Gwei-Djen  
THE EARLIEST SNOW CRYSTAL OBSERVATIONS.  
Weather, 16(10):319-327 incl. table, Oct. 1961. 25 refs.

DLC, QC851. W4

The hexagonal system of snow-flake crystals was first discovered by the Chinese. The oldest Chinese statements, going back to the second century B. C., antedate the first European observations by more than a millennium. Nothing appears to have been said about snow-crystal observations by Aristotle, Seneca or other classical authors. Albertus Magnus (A. D. 1260) thought the crystals were star-shaped and that such regular forms fell only in Feb. and March. The real beginning of knowledge of snow flakes in Europe is due to the astronomer Johann Kepler who published a 15-page tractate in A. D. 1611. Medieval Chinese contributions are discussed and the development of snow-crystal study in Europe is outlined. The foundations of modern knowledge were laid by William Scoresby, who, as a result of his travels in the Arctic just before 1820, drew up the first systematic classification of the forms of snow flakes. -- BLE

SIP 22736

551. 578. 41:551. 577. 11(52)

Sasyō Yoshio and Hiroshi Tokue  
ON THE PROBABILISTIC ANALYSIS OF PRECIPITATING CELLS DEFINED BY THE SPATIAL CONCENTRATION FALLING OF SNOW PARTICLES.  
J. Meteorol. Soc. Japan, Ser. 2, 42(2):128-138 incl. illus., graphs, April 1964. 1 ref.

DLC, Orientalia Div.

Photographic observations were carried out on the spatial concentration of falling snow particles. Photographs were taken with an 8 mm cine camera at the rate of 16 frames per minute. The frequency of each concentration, which is classified by 10-particle difference, was obtained for flurries and continuous snowfall. For flurries, the distribution frequency curve can be explained with Poisson's distribution function. Continuous snowfall is represented approximately as a Gaussian distribution. The probability density function of snow flurries lies between  $\lambda$  and  $\lambda + dx$ , where  $\lambda$  is the average concentration of each cell. The probability distribution function consists of 3 curves; one has a steeper and larger maximum value than the other, which may be Gaussian distribu-

tion in form at low concentration. This illustrates that the former corresponds to the distribution curve of original cells and the latter is due to snow particles blown from neighboring trees and roofs of huts. Auto-correlations were calculated from the fluctuation of spatial concentrations in both cases. (Authors' abstract, modified)

SIP 22737

551. 326. 2:551. 5:551. 309. 33(52)

Schell, I. I.  
INTERRELATIONS OF THE ICE OFF NORTHERN JAPAN AND THE WEATHER. J. Meteorol. Soc. Japan, Ser. 2, 42(2):174-185 incl. tables, graphs, June 1964. 13 refs.

DLC, Orientalia Div.

An analysis of the historical series of the ice-appearance date at Abashiri in northern Hokkaido, which, on the average, is Jan. 14, was made in terms of the mean monthly Jan. pressure gradient over the northern Okhotsk Sea, and the pre-Dec. pressure gradient upstream over northeastern Siberia. The results, showing a relationship based on 60 yr of data and a closer relationship based on cases when the departure in the pressure gradient from the average equaled or exceeded  $\pm 0.8$  (the standard deviation), suggest a limited basis for predicting the ice appearance date in northern Hokkaido. An analysis of the frequency of lows crossing Hokkaido and its environs also confirms the relationship of the Jan. and pre-Dec. pressure gradients to the north of Japan to the ice appearance date. A similar analysis of the ice disappearance date which, on the average, occurs April 22, shows a marked relationship with the contemporary April pressure gradient, but little, if any, relationship with the gradient to the north in March, presumably because of the discontinuous change in the general circulation during the spring in that area. It is also shown that the date of ice appearance at Abashiri, taken to reflect the circulation pattern over the area, correlates moderately with the following mean monthly Feb. air temperature over northeastern Hokkaido. (Author's abstract, modified)

SIP 22738

551. 578:528. 715:551. 578. 4(52)

Asai, Tomio  
PHOTOGRAPHIC OBSERVATION OF CLOUDS BY AIRCRAFT DURING SNOWFALL PERIOD IN HOKURIKU DISTRICT. J. Meteorol. Soc. Japan, Ser. 2, 42(2):186-196 incl. illus., graphs, maps, June 1964. 7 refs.

DLC, Orientalia Div.

The observations were made Jan. 20, 1963, as a part of a study of heavy snowfall in the Hokuriku District. The horizontal distribution and topography of clouds over the Japan Sea were studied by ordinary photogrammetric methods from an aircraft 8 km high. The photographs show a characteristic

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pattern changing from scattered cumulus clouds smaller than 1 km in horizontal and vertical dimensions in the west of the observation area to larger cumulus and cumulonimbus clouds extending 3 km in the east where upper stratiform clouds are present. The cumulus clouds appear to originate over the Japan Sea at least 200 to 300 km off the coast of Hokuriku District. A fair amount of snow may be released in Hokuriku District from the clouds which contain sufficient water. (Author's abstract, modified)

SIP 22739 551. 46:551. 326. 7(\*881)

Naval Oceanographic Office  
PRELIMINARY REPORT OF OPERATION DEEP  
FREEZE 1963. ROSS SEA OCEANOGRAPHIC SUR-  
VEY. Prelim. Rept., Washington, D. C., 4p. incl.  
table, map, May 2, 1963. (Serial No. 2346)  
DDC, AD 406270

The survey was accomplished in the Antarctic during the austral summer of 1962-63 aboard the USS EDSTO (AGB-2), and 122 oceanographic stations (including 24 ice-forecast stations) were occupied. The location of the stations is shown and, during the survey, the corrected position for the Ross Ice Shelf front was determined to be from Ross Island eastward to about 180° long. Besides the standard oceanographic observations, bottom-sediment and biological samples were collected. Serial oceanographic data were collected with Nansen bottles placed at preselected depths extending from sea surface to the bottom. Organic and inorganic debris were collected at Cape Adore, Cape Hallett, and Ross Island for thermophilic mycoflora examination. Special oceanographic casts were made to obtain water samples for geochemistry trace element studies, and bottom biological samples were taken for paleoecological investigation. -- B.L.E

SIP 22740 551. 322:548. 51:661. 857. 35

Snelling, Hilda Jane  
PRODUCTION EFFICIENCY OF DIFFERENT SILVER  
IODIDE ICE-FORMING NUCLEI GENERATORS.  
Thesis (M. A.), Oregon State Univ., 30p. incl. illus.,  
tables, graphs, June 1963. 17 refs.  
DDC, AD 407457

Three silver iodide ice-forming nuclei generators were tested: one burning charcoal soaked in a 2% AgI acetone solution, one in which a jet of propane gas atomized a 2% AgI acetone solution, and one in which a jet of compressed air atomized this same solution. An optical pyrometer measured the generator operating temperatures. The Bigg-Warner ice nuclei counter was used to count the effective ice nuclei produced by the generators at -12, -15, and -20°C. The efficiency of the generator was determined by the number of active nuclei produced per

second of operation and the number of active nuclei produced per gram of AgI. In all cases, the acetone air generator had higher efficiency. The acetone air generator and the propane generator had equal efficiency at the two operating temperatures tested. (Author's abstract, modified)

SIP 22741

551. 326. 7(\*3)

Mathews, F. S. and F. C. Clarke  
ARCTIC COMMUNICATIONS STUDIES. THE  
ELECTRICAL, STRUCTURAL AND TOPOGRAPHICAL  
CHARACTERISTICS OF ARCTIC SEA ICE.  
Rept. No. 52-P-1, Vol. 1, U. S. Navy, Bureau of  
Ships, [81]p. incl. illus., tables, graphs, diagr.,  
map, appendixes A-C, June 27, 1962. 41 refs.  
(Contract No. N08687)  
DDC, AD 408261

The nature and extent of the Arctic ice cover is described, and the history of Arctic geograph exploration is summarized. A detailed analysis is made of the factors which influence the electrical properties of sea ice so that meaningful estimates of these properties may be made. The significant physical properties of sea water are discussed; the major factors present in sea-ice formation are described; and the geometrical and chemical factors likely to affect the electrical properties are outlined. The electrical data are considered and anticipated trends in the electrical properties of sea ice are discussed. The topographical features of Arctic sea ice are described and tabulated so that estimates may be made of the extent and thickness of the low conductivity cover over the higher conductivity sea water. As an aid to the research worker in this field, experimental precautions and pitfalls are listed and avenues of study are suggested. A glossary is appended along with a listing of major ice research centers, a bibliography of major sources of information on Arctic ice and a collection of chemical definitions and techniques. (Authors' abstract, modified)

SIP 22742

551. 326. 14:551. 466. 6

Hendrickson, James A. and Lois M. Webb  
THEORETICAL INVESTIGATION OF SEMI-INFINITE  
ICE FLOES IN WATER OF INFINITE DEPTH. Final  
Rept., U. S. Naval Civil Eng. Lab., 43p. incl.  
graphs, diagrs., June 1963. 3 refs. (Contract NBy-  
32225)  
DDC, AD 414532

The response of semi-infinite ice floes to water waves is analyzed for deep water. If the floe submergence is neglected it is found that a progressive wave is transmitted. The stress produced by this transmitted wave is determined for various floe thicknesses and incident wave lengths. When the submergence is not neglected it is necessary to use a finite difference approach to the solution. Such a solution is attempted and the results and accompanying numerical problems are considered in detail. (Authors' abstract)

# CRRCL BIBLIOGRAPHY

SIP 22743

541. 182:536. 421:517. 63

Wilcox, W. R.  
SOLUTE REDISTRIBUTION DURING SOLIDIFICATION OF EUTECTIC-FORMING MIXTURES. Rept. No. TDR-168(3240-10;TN-2;SSD-1DR-63-160, Aerospace Corp., El Segundo, Calif., 27p. incl. table, graphs, appendixes A-B, July 22, 1963. 11 refs. (Contract AF 34(695)-169)  
DDC, AD 415433

The problem of the progressive freezing of a simple eutectic-forming binary mixture from an infinite melt with pure diffusional mass transfer is solved by the Laplace transforms method. Separate solutions are presented for the initial and terminal periods, and a comparison is made with zone melting results. The validity of a previous approximate solution for zone melting of such mixtures was verified in the limit of infinite zone size. The problem discussed in this paper is important because it extends previous results (which were valid only for very dilute mixtures) into the region of high solute concentrations. The present results will aid in the prediction and interpretation of results of purification work such as sea-water desalinization and single crystal growth in which the eutectic composition is reached. -- BLE

SIP 22744

551. 326. 83(437)

Čermák, Miroslav  
ICE CONDITIONS IN CZECHOSLOVAKIAN RIVERS. (Zamrzání Československých řek; Text in Slovak with Russian and German summaries). Vodohospodářský časopis, 12(3):271-277 incl. graph, 1964. 11 refs.  
DLC, GB772 C95V6

The ice conditions in the Elbe, Oder, and Morava Rivers, and the Czechoslovakian Donau tributaries have been observed since the 1870's. The observational data up to 1934 and since 1941 are available in year books which were originally published by the Vienna Hydrographic Bureau, then by the Prague Hydrological Office, and later by the Prague Hydrometeorological Office. This article discusses data from 231 observation stations up to 1962. The first appearance of ice, ice slurry, and shore ice was not always reliably indicated. The data are more precise on the appearance and disappearance of an ice cover and on ice flow. River ice first appears in the beginning of Oct. and often remains until May. At the individual observation stations, river ice lasted 54 to 180 days; however, the most frequent duration was 80 to 94 days. Ice covers lasted from 80 to 94 days and occur from the end of Oct. to mid-April. The median number of days with an ice cover is 25 to 40. The maximum number of days with ice was recorded from 1941 to 1942. The maximum duration of an unbroken ice cover occurred during the 1928-29 and 1946-47 winter periods. The average thickness of the ice cover was 40-50 cm; however, drifting ice was recorded up to 125 cm thick. The relationship between the water and air temperature was not determined. Data are also lacking for ice conditions along the river course. (Author's summary, modified)

SIP 22745

551. 46:551. 326:551. 513(+66)

Kryndin, A. N.  
SEASONAL AND ANNUAL VARIATIONS IN THE ICE COVER AND POSITION OF THE ICE EDGE ON THE FAR EASTERN SEAS IN CONNECTION WITH CHARACTERISTICS OF THE ATMOSPHERIC CIRCULATION. (Sesonnnye i mezhgodovye izmeneniya ledovitosti i polozheniya kromki l'da na dal'nevostochnykh moryakh v svyazi s osobennostyami atmosfery (tsirkulatsii); Text in Russian) Trudy Gos. Okeanograf. Inst. (Moscow), Vyp. 71:5-82 incl. tables, graphs, maps, appendix, 1964. 21 refs.  
DLC, GC1 M58

The article discusses the mean monthly values for the ice extension and ice edge for the Sea of Japan, Sea of Okhotsk, and the Bering Sea, calculated on the basis of shipboard and aircraft observations during the winters from 1928 to 1960. The seasonal and annual variations of ice-cover extent and the position of the ice shelf are analyzed in detail. A comparative appraisal is made of characteristic elements observed in ice-cover variation and the position of the ice shelf on the seas of the entire far eastern basin. Much attention is paid to an investigation of ice-cover extent fluctuations as a function of seasonal and annual variations in atmospheric circulation in the Far East and northern areas of the Pacific Ocean. The paper should serve as a basis for the development of methods of long-term prognostication for the individual far eastern seas and for the basin as a whole. Present ice-observation methods are inadequate and the operations of coastal hydrometeorological stations and posts should be reorganized. Modern methods of estimating atmospheric circulation are reviewed as employed in the long-term prognostication of hydrometeorological phenomena. The indices of Kalz and Drogaitsev are most acceptable for ice forecasting. (JPRS abstract, modified)

SIP 22746

551. 46:551. 326:528. 7

Beitin, V. V., S. M. Losev and K. P. Shirokov  
AERIAL PHOTOGRAPHY OF MARINE ICE FLOES. (Aerofototsemka drel'ia l'dov v more; Text in Russian) Trudy Gos. Okeanograf. Inst. (Moscow), Vyp. 71:125-140 incl. graphs, diagr., 1964. 5 refs.  
DLC, GC1 M58

Section one discusses aerial photographic field work in general terms; section two analyzes the results of the aerial photography performed in the Gulf of Finland in 1961; section three deals with method accuracy; and the last section gives a detailed description of the use of repeated aerial photographic sorties for the study of ice drifting in Kurah Bay (Kurshekkil Zaltv) and in the adjacent area of the Baltic. This method permits the establishment of the laws of ice drifting as a function of wind conditions and embraces all varieties of ice encountered at

# CRREL BIBLIOGRAPHY

sea. Aerial photography operations can be carried out over routes enclosed between reference points on dry land, by parallel extension routes, or by routes running along the coast line. The smallest scales permissible under the given weather conditions, flow dimensions and resolving power of the photographic equipment in use should be employed. Before photographing an ice drift from the air, it is expedient to drop special floats containing a charge of fluorescent material in the intervals between the floes. The exposure should be made on a small scale for the ice drift proper and on a larger scale for the disposition of the floating markers. Problems relating to the accuracy of the determination of ice drift elements at sea by vertical aerial photography require further development and refinement. (JPRS abstract, modified)

SIP 22747 624. 144. 534:625. 1(437)

Anténe, František  
SNOW REMOVAL BY FLAME THROWER  
(Odstraňování sněhu plamenometem; Text in Slovak).  
Železniční Doprava A Technika, 12(3):76-77, March 1964.  
DLC, TF4. Z47

The advantages of the flame thrower over jet engine exhausts are described. The flame throwers can clear railroad switches of snow in 20 to 150 sec. Additional snow falling on the hot tracks will melt and the unburned portion of the flame thrower fuel, when spread on the rails, will prevent icing even in severe frosts. Switches were still clear 5 hr later, in spite of continuous snowing. The flame thrower is mounted on a railroad car which can be pulled by a small locomotive. One tank of fuel lasts for several days of operation whereas jet engines have to be refueled hourly. No railroad ties were burned. Easily obtainable materials and discarded high pressure tanks were used to construct the flame throwing equipment. Two men operated the flame thrower and one operated the locomotive. -- GDH

SIP 22748 624. 147:551. 321. 3  
629. 11:551. 578. 46(\*50)

Pogodin, K.  
RESEARCH AND DEVELOPMENT OF ARCTIC-POLAR AND OTHER HEAVY EQUIPMENT AT THE GOR'KIY POLYTECHNIC INSTITUTE. (Tvorby neobychnykh mashin; Text in Russian). Pravda (Moscow), No. 338 (16214), p. 2, Dec. 24, 1962. (Eng. transl.: Office of Tech. Services, U. S. Dept. of Commerce, Wash., D. C., OTS-63-21386)  
DLC, Newspaper Reading Room; DDC, AD 403253

This article discusses (1) equipment for constructing roadways on ice, with a crusher and vibrator drawn by a caterpillar tractor which can process up to 1-1/4 km of roadway per hour; (2) a machine for

breaking up ice around ships in winter mooring constructed on the basis of a caterpillar transport machine which can cut through a 200-m stretch in an hour making a wide breach in thick ice, and will not sink; and (3) the "Pingvin" snow vehicle which will reach 50 km/hr. Research is being conducted also on excavators to be used under permafrost conditions.  
-- BLE

SIP 22749 528. 9(084. 4):531. 326. 03

Armstrong, Terence  
ICE ATLASES. Polar Record, 12(77):161-163 incl. maps, May 1964. 8 refs.  
DLC, G575. P6

Ice atlases summarize in cartographic form existing knowledge of the seasonal distribution of floating ice (mainly sea ice). The atlases present a summary which is based on the greatest possible number of observations within a given period, in order to deduce probable future ice distribution, thus differing from ice charts which show only actual distributions at particular times. The concentration (tenths of sea surface covered by ice) and age of ice are the variables to be defined. Concentration is either presented by the use of isopleths, showing mean or extreme limits of various kinds of ice, or by sector diagrams ("cakes") which are actual records of observations at selected points. Antarctic coverage is available in the oceanographic atlases of the U. S. Navy Hydrographic Office, 1957-58, in which the isopleth method is used. The sector diagram method of presentation is used in an atlas published by the Admiralty Hydrographic Department covering Antarctic waters between 7° and 92°W. Air reconnaissance and the increase in shipping has brought about a rapid increase in the rate at which ice observations are made. Needed is a sector diagram atlas of the rest of the Antarctic seas, taking into account observations made during and after the IGY. -- MFG

SIP 22750 551. 574. 7:629. 13:551. 576(\*3)

Burova, L. P. and A. I. Voskresenskiĭ  
METEOROLOGICAL CONDITIONS FOR AIRCRAFT ICING IN AS AND AC CLOUDS. (Meteorologicheskie usloviya obledeneniya v oblakakh tipa As i Ac; Text in Russian). Trudy Arkticheskogo i Antarkticheskogo N.-I. Inst. 239(2):95-103 incl. illus., tables, 1962. 9 refs. (Eng. transl.: Office of Tech. Services, U. S. Dept. of Commerce, Wash., D. C., TT:64-51938, Dec. 15, 1964)  
DLC, G600. L4

The paper discusses the meteorological conditions which cause aircraft icing in middle-level Arctic clouds and climatological characteristics of altostratus (As) and altocumulus (Ac) clouds, based on the literature and observational data. An expression is presented with which icing intensity can be estimated quantitatively. The probability of icing in-

# CRREL BIBLIOGRAPHY

creases from spring to fall. The most probable As and Ac clouds are most commonly found in the 1800 to 3400-m range, where 80% of all clouds are found. The thickness of air-mass clouds usually does not exceed 360-420 m and does not present a danger for aircraft. The greatest threat of icing is found in middle-level frontal clouds whose vertical thickness can attain 1000 m or more. Icing probability in As clouds is 28%, in Ac clouds it is 41%. The mean icing intensity does not exceed 0.6 mm/min, the maximum intensity is 2.8 mm/min. Moderate and heavy icing occurs most frequently in As and Ac frontal clouds in the western region of the Arctic. More intense icing occurs in the As clouds which have a higher liquid-water content. Icing in middle-level clouds is possible in the -2.5 to -36.2°C temperature range. Moderate and heavy icing can occur at -20°C and lower. -- BLE

SIP 22751

551.345:539.42:534.6

Wachholz, H. and G. Muller:  
THE RELATIONSHIP OF THE ULTIMATE STRENGTH  
AND SOUND VELOCITY IN FROZEN LAYERS OF  
SOIL WITH REGARD TO THE CONSTRUCTION OF  
FROZEN SHAFTS. *Z. Geophysik*, 30(3):127-139  
incl. tables, graphs, 1964. 20 refs.  
DLC, QC801.24

The ultimate strength of iced-soil layers is determined by the strength of the ice and by the increase in strength which the soil component contributes to the total body. The strength is calculated of an iced sand model with no direct contact between the grains; this value is used for comparison with other iced layers. Such an iced-sand layer has the least ultimate strength and therefore the least permissible strain. Just as the E-modulus of any other iced layer is larger than that of this model, the strength will also be greater. The E-modulus may be evaluated from the measurements of the sound velocity. However, this velocity gives only the rise of the tangent at one point in the stress-strain relationship of the measured frozen-soil layer. Therefore, formulas are derived with which the least value of the E-modulus can be estimated. With this E-modulus, the ultimate strength of a frozen soil layer can be compared with the strength of the iced-sand model. (Authors' abstract, modified)

SIP 22752

629.139.85:551.578.46(\*38)

Abele, Gunars  
CONSTRUCTION OF A SNOW RUNWAY AT CAMP  
CENTURY FOR WHEEL LANDINGS WITH LIGHT-  
WEIGHT AIRCRAFT. Special Rept. 62, U. S. Army  
Cold Regions Research and Engineering Laboratory,  
4p. incl. graph, appendix, Aug. 1964. 4 refs.  
CRREL files

This report discusses the type of runway required, the method of construction, the effort involved, approximate construction time, and suggested maintenance of such a runway at Camp Century. Data are presented concerning the specifications and average contact pressure (35 to 38 psi) of a typical lightweight aircraft (the "Caribou"), and required ram-hardness profiles. A 200 to 300 ram-hardness range is required. The runway should be constructed on the existing runway at Camp Century. Periodic ram-hardness tests should be made during the initial age-hardening period as well as during the use of the runway. The first landing should be made on skis. The runway (5000 x 150 ft with a 3 to 4 ft cut) could be constructed in 2 weeks using two Peter plows, considering delays due to weather, maintenance, and minor mechanical difficulties. Drift-snow accumulation during summer months should be compacted with an LGP tractor. New snow accumulation should never be removed. Oil or fuel spots on the runway surface should be removed or covered with snow to avoid the formation of pot holes when exposed to sun. The appendix discusses the use of the ramsonde hardness instrument for determining the supporting capacity of a snow runway and an expression is given for computing ram hardness. -- BLE

SIP 22753

631.47(\*464.2)

Day, J. H.  
CHARACTERISTICS OF SOILS OF THE HAZEN  
CAMP AREA, NORTHERN ELLESMERE ISLAND,  
N. W. T. Rept. No. D Phys R(G) Hazen 24, Defence  
Res. Board (Can.), 15p. incl. illus., tables, map,  
Nov. 1964. 11 refs.  
DLC, Tech. Rept. Collection

Morphological and chemical characteristics, and the classification of the soils in this area are presented. Samples were analyzed at various depths at 12 sites. The classification of the soils at each site is given according to the Canadian and U. S. D. A. systems. No significant development exists of genetic horizons and hence all but two profiles (Gleysols), are classified as Regosols. The effects of deficient soil moisture and sparse vegetative cover are reflected in the low organic matter content of the surface soil. In all of the profiles the organic matter content is higher than 0.35% in the deepest layer, a characteristic which, together with the erratic distribution, places the soils in the cumulic subgroups in the U. S. D. A. classification system. The occurrence of soluble salts in dry Arctic regions is common. Photographs are given of the surface topography and soil profile at each site. -- BLE

# CORREL BIBLIOGRAPHY

SIP 22754

693.547.3(\*50)

Kireenko, I. A.  
CONCRETE, STONE AND PLASTER WORK IN COLD WEATHER. (Betonye, kamennye i shtukaturnye raboty na moroze; Text in Russian). Kiev, Gos. izd-vo lit-ry po stroitel'stvu i arkhitekture USSR, 1962. 272p. incl. illus., tables, graphs, diagra. 65 refs.

DLC, TH153. K5

The technological properties of cement mixes and lime cement slurries determined by theoretical, practical, and laboratory work, and checked in practice during various climatic conditions are discussed. A theory of the setting of mortars and mixes in cold weather is proposed; it shows that temperature fluctuations increase the solidity of concrete structures. The "thermos" method of working concrete in freezing weather, proposed in 1918, is developed. The method of carrying out plastering and mortar work by keeping the mix in a warm place until the beginning of the actual setting was found preferable to using chemical additives for speeding the process of solidification. -- VDP

a whole day to restart them. A helicopter was used to overcome poor visibility. Despite wind and drifting snow, nearly 5 mi/day were averaged. In one four-day period, 52 mi of trail were built which included a 200-ft ice bridge across the Hart River. Bridging was carried out by cutting a hole in the ice to test thickness and strength, and measuring the distance from the surface to the river bottom to determine the height that earth and debris had to be piled across the river. Smaller creeks were bridged with logs which were usually cut on the site. When finished, the hard winter surface enabled the trucks to travel almost as fast as on a regular highway. -- BLE

SIP 22755

551.324.433(931)

Skinner, B. E.  
MEASUREMENT OF TWENTIETH CENTURY ICE LOSS ON THE TASMAN GLACIER, NEW ZEALAND. New Zealand J. Geology and Geophysics, 7(4):796-803 incl. illus., table, graph, map, Nov. 1964. 9 refs.

DLC, QE1. N55

In Nov. 1962, levels were determined along two profiles across the lower ablation zone of the Tasman Glacier on lines originally surveyed by T. N. Brodrick 72 years earlier. These show that at an altitude of 1100 m an average thickness of 82.1 m of ice has been lost since 1890. The total mass loss over the whole ablation zone during this time is of the order of  $3 \times 10^{12}$  kg. (Author's abstract)

SIP 22757

624.144.55(\*41)

Petersen, Eric V.  
IN B. C. SNOW BIG RIGS ARE TOPS. Roads and Eng. Construction, 100(11):39-44 incl. illus., Nov. 1962. DLC, TA1. R58

The most popular equipment used for snow removal throughout British Columbia is described. Crawler tractors are used to provide winter access for oil and mining companies in the far north and to handle clearing in other remote regions. Since regular dozer blades are often used on these crawlers to move snow (with angle dozers preferred), it is impossible to estimate how many of these machines are used per winter. Rubber tired rigs are used by many municipalities. They have extra maneuverability and do not damage pavements. The best known rigs on Canadian roads are the patrol graders used while the snow is still settling. At least 400 of these machines are on B. C. roads during the winter. Blowers are used for pioneering jobs in deep snow. The Snow-master blower can clear an 8-ft path. A custom-built rig (the Pacific Snow Mover) moves snow at speeds up to 45 mph. It cuts a 10-ft swath, has a Frink Roll-Over hydraulically reversible blade, and a radiator mounted behind the cab. -- BLE

SIP 22756

624.139.625.7(\*41)

385 MILE ROAD ABOVE ARCTIC CIRCLE BUILT IN NINETY DAYS. Roads and Eng. Construction, 98(5):78-81 incl. illus., May 1960.

DLC, TA1. R58

The main problems encountered upon constructing a temporary winter truck trail to a well site 100 mi above the Arctic Circle in the Bell River basin are discussed, and the construction methods and equipment are described. Temperatures averaged -30°C. One of the important tools used was a ripper, without which frozen gravel and weeping glaciers could not have been moved. With engines never turned off, fuel was a big problem. If tractors were stopped it took

SIP 22758

624.144.55(\*41)

18 PAGES OF THE LATEST SNOW REMOVAL EQUIPMENT. Roads and Eng. Construction, 100(11):45-63 incl. illus., Nov. 1962.

DLC, TA1. R58

Twenty-seven pieces of snow removal equipment are illustrated and described. The units, each made by a different company, include rotary-shovel snow plows and blowers, crawler loaders, spreaders, and melters. The general design of the equipment is briefly summarized, and data are given on snow removal efficiency. -- BLE



# CRREL BIBLIOGRAPHY

SIP 22759

624. 144. 55(\*41)

Eddowes, John

DRAIN IT AWAY. Roads and Eng. Construction, 100 (10):74-76 incl. illus., tables, Oct. 1963.

DLC, TAI. R58

Fully-mobile, semi-mobile, and stationary types of snow melters are discussed which let the melt drain into sewers. The first trial of this system was in 1959 in Worcester, Mass. It was estimated that over a short period of time the operational cost was about half that of conventional methods. The principle involved is "submerged combustion" which is achieved by a high velocity oil or gas burner capable of releasing over ten million BTU per ft<sup>3</sup> of combustion space. The same burner is installed in all units although the size of the units and the number of burners vary greatly. The burner fires downward, directing the hot gases of combustion through a stainless steel "down-comer" tube which is immersed below the water level in a pit or tank. The melted snow runs off through an overflow drain into a storm sewer or other suitable drainage. The fully-mobile unit melts 260 yd<sup>3</sup> or 85.6 tons of snow per hour. During stationary operation, 264.4 yd<sup>3</sup> or 89.5 tons are melted. In the semi-mobile type, everything except the melting tank is on a trailer and the melting is done in a pit. Thus the same burner can service several pits by moving from one to another as the plowing pattern progresses. The capacity is 25 tons or between 75 and 125 yd<sup>3</sup> per hour. -- BLE

Spitsbergen where the frost-controlled processes are measurable and have been operating only during the postglacial interval. The four zones of geomorphic development between the equator and the polar region, as mapped by Büdel, are discussed together with the significance of the structural determination of river courses. -- BLE

SIP 22761

551. 324. 28(\*7)

Giovinetto, Mario B. and John C. Behrendt

THE AREA OF ICE SHELVES IN ANTARCTICA. Polar Record, 12(77):171-173 incl. table, map, May 1964. 5 refs.

DLC, G575. P6

The total area of all Antarctic ice shelves, excluding attached islands and ice rises, is estimated at  $(1.63 \pm 0.30) \times 10^6$  km<sup>2</sup> using charts compiled in 1962. Except for the Shackleton and West Ice Shelves, the areas of the shelves are greater than previously estimated. The boundaries of grounded ice features in the Filchner Ice Shelf, delineated during the 1963-64 summer, give new significance to the geographical and geophysical data collected in the region since 1957, and indicate a more definite partition of the ice shelf than has been suggested in current charts. (Authors' abstract)

SIP 22760

551. 331. 5(931)

Cotton, C. A.

A NEW THEORY OF THE SCULPTURE OF MIDDLE-LATITUDE LANDSCAPES. New Zealand J. Geology and Geophysics, 6(5):769-774 incl. diagr., Nov. 1963. 15 refs.

DLC, QE1. N55

In explanation of a landform texture much coarser than that common in New Zealand, such as that which prevails in some middle-latitude regions, it has been suggested that normal dissection by streams was interrupted in the glacial ages over extensive areas that were not actually glaciated by the onset of periglacial erosion, especially by the swamping effects of superabundant solifluction. Hack's theory (1960) states that the general form of many landscapes has remained unchanged after attaining equilibrium perhaps millions of years ago, although downwasting of the surface has continued. According to Büdel (1963), most of the relief features in the middle latitude regions that have escaped glaciation but have been subjected to "periglaciation" were rapidly shaped by the deep excavation of broad valleys in the Pleistocene. The excavation process, halted in the Holocene and suspended in the interglacial ages, produced the present relict relief. Büdel's quantitative estimate of the speed of such periglacial-fluvial valley erosion is based on observations made in southeastern

SIP 22762

551. 322.548. 51:547

Garten, V. A. and R. B. Head

HYDROGEN-BONDING PATTERNS AND ICE NUCLEATION. Nature, 204(4958):573, Nov. 7, 1964. 2 refs.

DLC, Q1. N2

Laboratory investigations of hydrogen-bonding patterns of organic crystal surfaces have shown that the ability to nucleate ice can be predicted reliably if the complete crystallographic structure is known. Both "parametric" fit and the density of hydrogen-bonding groups are essential factors conferring nucleative ability, and it is on these principles that a new organic highly effective nucleating material has been forecast for the first time. A consideration of the crystal structure of the  $\alpha$ -isomer of 1:3:5-cyclohexanetriol dihydrate ( $\alpha$ -phloroglucitol dihydrate) implied high nucleative power, which was confirmed by cloud chamber tests. Each oxygen atom in the 111 plane of the rhombohedral  $\alpha$ -phloroglucitol dihydrate corresponds to an ice oxygen, the discrepancy being 4.8%. The density of oxygen groups is very close to that of ice and about 50% greater than on the 100 plane of phloroglucitol dihydrate. -- BLE

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SIP 22763

551. 578. 7(680)

Carte, A. E.  
HAIL STUDIES IN THE PRETORIA-WITWATERS-  
RAND AREA. Nuusbrief (News Letter), No. 173:  
136-140 incl. graphs, Aug. 1963. 4 refs.  
DLC, GPRR

The results are reported of a 1000-mi<sup>2</sup> rectangular hail reporting network (Oct. 15 to July 31, 1962-63) which includes Pretoria and Johannesburg, South Africa. One fourth of the project area has at least one observer per mi<sup>2</sup> while no area greater than 5 mi<sup>2</sup> is without an observer. November accounts for more than half the total number of reports and practically all of the large hail (>3 cm). Hail was reported on 56 days. The worst storm occurred on Nov. 28 in Pretoria where hailstones up to 5 cm in diam. caused much damage to property within an 8-mi<sup>2</sup> area. There is a tendency for storms in this region to grow on the left flanks of the upper winds and to dissipate on the right flanks. The opposite has been noticed for storms in the U. S. A. About 1/3 of the reports stated that the observed hailstones were soft; 10% stated that hail preceded rain at a particular point on the ground. -- BLE

SIP 22764

551. 578. 7:551. 508. 85

Willis, J. T., K. A. Browning and D. Atlas  
RADAR OBSERVATIONS OF ICE SPHERES IN FREE  
FALL. J. Atmospheric Sciences, 21(1):103-108 incl.  
graphs, Jan. 1964. 26 refs. (Also: AFCRL-64-  
931, Environmental Res. Papers No. 70, Air Force  
Cambridge Res. Labs.)  
DLC, QC851. A283

Simultaneous measurements of the radar cross section and fallspeed of 5 cm (and larger) ice spheres falling in free air have been obtained using a high-precision tracking radar operating at a wavelength of 5.47 cm. While they were dry, the spheres fell with supercritical Reynolds numbers and drag coefficients of only 0.24 to 0.30. These coefficients are much smaller than those normally attributed to hailstones under any conditions. The surface of one sphere, 5.1 cm in diam., became wet during its fall. This was accompanied by a 5 db decrease in its normalized radar cross section and a twofold increase in its drag coefficient. The implications of these observations are discussed. (Authors' abstract)

SIP 22765

551. 322:539. 413

Stearns, S. Russell  
FLEXURAL PROPERTIES OF SNOW AND ICE.  
Special Rept. 59, U. S. Army Cold Regions Research  
and Engineering Laboratory, 8p. incl. tables, graphs,  
appendixes A-B, Oct. 1964. 12 refs.  
CRREL files

One testing objective was to determine if small, select samples of natural snow-ice, tested in bending, would provide consistent and higher values for the flexural strength and modulus of elasticity. Another objective was to investigate the surface bearing properties of snow-ice layers, formed during winter on lakes or rivers, which are often separated from clear ice by an interlayer of slush or water. Samples of this type of snow-ice were obtained from Post Pond in New Hampshire. The other forms of ice-cap snow, natural snow (top and 15-ft depth), and high-density snow were tested during two summers on the Greenland ice cap. Densities in all cases were obtained by cutting a cube of snow from the sample beam adjacent to the break. The apparatus used in testing the Post Pond snow-ice beams was a modification of a Soiltest hand-operated press with a 0- to 5000-lb proving ring. The field apparatus used in Greenland consisted of a wooden, three-point load device. Dense snow-ice at +5°F has high flexural strength (avg. 347.5 psi) and a high modulus of elasticity (avg.  $6.08 \times 10^5$  psi), probably the result of a large, interlocking crystal structure. The apparent relationship between modulus of elasticity and density of snow-ice is affected by the rate of loading and temperature. There appears to be a relationship between density and flexural strength for snow, snow-ice, and high-density snow in the natural undisturbed state; but processing, including snow compaction, lowers the tensile strength at early ages. The formulas used in computations are given and test results are tabulated and summarized. (Author's abstract)

SIP 22756

551. 521. 31:551. 593

Kasten, Fritz  
A NEW TABLE AND APPROXIMATION FORMULA  
FOR THE RELATIVE OPTICAL AIR MASS. Tech.  
Rept. 136, U. S. Army Cold Regions Research and  
Engineering Laboratory, 10p. incl. tables, appendix  
A-B, Nov. 1964. 15 refs.  
CRREL files

A new table of the relative optical air mass as a function of solar altitude is computed from the air density profile of the ARDC Model Atmosphere, 1959, up to 84 km;  $n_0 = 1.000276$  corresponds to air of 15°C and 1013.25 mb and to the wavelength 0.7  $\mu$ . This wavelength is more representative for the whole solar spectrum than 0.54  $\mu$  (peak of the visibility spectrum) because it divides the solar spectrum into 2 parts of equal energy. The new approximation formula contains constants which were calculated from the new tabulated values of the relative optical air mass as a function of solar altitude  $\gamma$  [deg] by successive approximation, applying the method of least squares to obtain each approximation. The values from this formula are in very good agreement with the tabulated values. The deviation is less than 0.1% for  $\gamma > 4^\circ$ . The highest deviation, 1.25%, occurs at  $\gamma = 0.5^\circ$ . The formula can also be applied to the old Bemporad table and to the table of relative optical water vapor mass computed by Schnaidt (1938). (Author's abstract)

# CRREL BIBLIOGRAPHY

SIP 22767

551. 324. 51

Weertman, J.

GLACIER SLIDING. Res. Rept. 162, U. S. Army Cold Regions Research and Engineering Laboratory, 14p. incl. table, graphs, diagrs., Nov. 1964. 13 refs.

CRREL files

A previous sliding theory (Lilbourny's theory being the extreme limiting case) is generalized by including pressure-melting and stress-concentration mechanisms. Obstructed ice melts on the upstream-high pressure side of an obstacle; the melt water flows around the obstacle to the low-pressure side where it refreezes. Ice motion around large protuberances is based on the enhancement of the creep rate caused by stress concentrations near obstacles. Obstacles of different dimensions are considered. Sliding velocity caused by pressure melting is the change in hydrostatic pressure from one side to another; that which results from creep rate enhancement equals the creep rate times the effective motion distance. For certain thicknesses of a glacier the sliding velocity is a double-valued function of the shear stress. Sliding velocity and the controlling obstacle size depend upon whether or not Glen's condition (i.e., a sufficiently large hydrostatic pressure) is satisfied. A water layer (at the bed of a glacier) with a thickness an order of magnitude smaller than the controlling obstacle size can cause an appreciable increase in sliding velocity. (Author's abstract)

SIP 22768

551. 521. 1(21)

Bolsenga, S. J.

DAILY SUMS OF GLOBAL RADIATION FOR CLOUDLESS SKIES. Res. Rept. 160, U. S. Army Cold Regions Research and Engineering Laboratory, 124p. incl. illus., tables, graphs, Nov. 1964. 15 refs.

CRREL files

Quantitative information on global radiation for studies pertaining to the distribution, accretion, and ablation of ice and snow, thawing of soils, evaporation, and climatology is given in tables containing radiation received on a horizontal surface under cloudless skies. Sums of global radiation were computed as a function of geographic latitude, declination of the sun, precipitable water content of the atmosphere, and atmospheric dust attenuation to the solar beam. A method of computation published by W. H. Klein (1948) for determining global radiation inside the atmosphere was followed. Expressions are given for determining (1) daily sums of extra-terrestrial solar radiation, (2) daily solar radiation at the surface of the earth, (3) atmospheric transmission as a function of the optical airmass, (4) the effect of dust attenuation on solar energy, (5) daily sums of direct solar radiation at the surface of the earth, and (6) total precipitable water vapor content of the atmosphere. (Author's abstract)

SIP 22769

551. 32

Mellor, Malcolm

SNOW AND ICE ON THE EARTH'S SURFACE. Rept. II-C1, Cold Regions Science and Engineering, 163p. incl. illus., tables, graphs, diagrs., maps, July 1964. 305 refs.

CRREL files

This monograph summarizes existing knowledge of snow and ice on the earth's surface. The eleven chapters are entitled Natural forms of ice, Glaciers, Deposition and accumulation of snow, Snow metamorphism and ice formation, Glacier flow, Wastage of glacier ice, Mass economy and glacier fluctuations, Temperatures in glaciers, Past glaciations, Sea ice, and Glaciological techniques. World wide examples are used with particular emphasis on the Arctic and Antarctic. A comprehensive bibliography is included at the end of each chapter. -- BLE

SIP 22770

551. 311. 8:551. 324. 433(515)

Shih, Ya-feng and others

GLACIAL MUD-STONE FLOW AT KU-HSIANG IN TIBET. (Hsi tsang ku hsiang ti ch'ü te ping ch'uan ni shih liu; Text in Chinese). K'o hsiieh t'ung pao (Science Bulletin), No. 6:542-544 incl. illus., June 1964.

DLC, Orientalia Div.

In Ku-hsiang, Tibet, mud-stone flow due to glacier melting on high mountains (5500 m) ruins field crops and forests and causes other damages every year. The largest flow, which occurred in 1953, was 200 m high, 1.5 to 3.5 km wide and 2 km long. A stone was found as large as 20 x 12 x 8 m in area and 4000 tons in weight. The river level was raised 40 m and affected the river bank for a distance of 70 km. In 1963, the largest stone found weighed 940 tons. The width of the Po-tou-tsang-pu River was narrowed to only 30 m. The upper stream became a lake 1 to 2 x 5 km in area and the water level was 12 m higher than in the previous year. Weather conditions prior to such flows are discussed and an attempt is made to correlate them with the origin of mud flows. -- CST

SIP 22771

551. 332:551. 79

Huang, Ti-fan and Shih-cho Yang

NEW GLACIAL RELICS IN THE MIDDLE AND DOWN-STREAM AREAS OF THE YANG-TZU RIVER. (Ch'ang ch'ang chung hsiang yu hsin ti yu kuan ping ch'uan yi chi te chi lu; Text in Chinese). K'o hsiieh t'ung pao (Science Bulletin), No. 6:544-547 incl. illus., diagrs., maps, June 1964.

DLC, Orientalia Div.

Quaternary glacial relics were studied in the middle and down-stream areas of the Yang-tzu River in June

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and July of 1963. A striated boulder about 1 m in diameter was found which had a groove 4-6 cm in diameter. It was inferred that the groove was carved by sharp glacier ice during the glacial epoch. Various evidence was found on the west bank of Lake Tung-ting which supports the theory that the Quaternary accumulation of Mt. Huang-ku consisted of glacial mud and gravel. The topography of the glacial relics was like those found at En-shih Basin, Hupeh, which were studied by Szu-kuang Lee in 1940. -- CST/BLE

SIP 22772

551. 326. 022(+666)

Watanabe, Kantaro and Masaomi Akagawa  
SEA ICE OBSERVATIONS ALONG THE OKHOTSK COAST OF HOKKAIDO FROM JANUARY TO APRIL 1961. (1) SEA ICE CONDITIONS OBSERVED BY AIRCRAFT. (1961 nen 1-4 gatsu Hokkaidō kaihyō hōkoku. (1) Kōkiki kansoku ni yoru 1961-nen no kaihyō jōkyō; Text in Japanese with English summary). Hakodate kaiyō kishōdai yōhō (Bulletin of the Hakodate Marine Observatory), No. 10:1-22 incl. tables, maps, Dec. 1963. 7 refs.  
DLC, Orientalia Div.

Pack ice appeared earlier off the coast of Hokkaido during 1961 than in any other year since 1957. The ice first appeared at the beginning of Jan. The early stage appeared in mid-Jan.; the developing stage was observed the last of Jan.; the dominant stage, the beginning of Feb.; the fluctuating stage, the middle and last of Feb.; the decaying stage, March; and the last stage was in April. In the sea southeast of Hokkaido, the dominant stage existed from the last of Feb. to mid-March. The influence of the pack ice was also greater during 1961 than at any other time since 1957, but the approach of pack ice to the coast was greater in 1957 when the dominant stage appeared in the middle and last of March. Compared to 1960, the magnitude of the ice was greater in 1961 but the changes in distribution for the two years were similar. The drifting of pack ice southeast of Hokkaido and in the Soya Strait was remarkable and unusually strong in the former. (Authors' abstract, modified)

SIP 22773

551. 326. 7(+666)

Akagawa, Masaomi  
SEA ICE OBSERVATION ALONG THE OKHOTSK COAST OF HOKKAIDO FROM JANUARY TO APRIL 1961. (2) SEA ICE CONDITIONS BASED ON COASTAL OBSERVATIONS. (1961-nen 1-4 gatsu Hokkaidō kaihyō hōkoku. Engan kansoku ni yoru 1961-nen no kaihyō jōkyō; Text in Japanese with English summary). Hakodate kaiyō kishōdai yōhō (Bulletin of the Hakodate Marine Observatory), No. 10:23-42 incl. illus., tables, graphs, maps, Dec. 1963. 9 refs.  
DLC, Orientalia Div.

The observations were conducted at weather stations, maritime safety stations, and light houses. The freezing of shore ice and the appearance of pack ice were much earlier than normal and the sea-ice conditions were dominant in Jan. and Feb. In March, the influence of the sea ice declined suddenly and the pack ice off the coast of Hokkaido in the Sea of Okhotsk disappeared earlier than usual. The influence of pack ice during this winter was very great and the drifts in the North Pacific and the Soya Strait were remarkable. In Jan.-Feb., pack ice struck the coast of Soya District and in March greater quantities were observed off the southeast coast of Hokkaido than have been seen in many years. The ice caused much damage to seaweeds and navigation. (Author's abstract, modified)

SIP 22774

551. 326. 7(+666)

Akagawa, Masaomi  
SEA ICE OBSERVATION ALONG THE OKHOTSK COAST OF HOKKAIDO FROM JANUARY TO APRIL 1961. (3) SEA ICE CONDITIONS BASED ON INFORMATION FROM SHIPS. (1961-nen 1-4 gatsu Hokkaidō kaihyō hōkoku. Senpaku karano jōho ni yoru 1961-nen no kaihyō jōkyō; Text in Japanese with English summary). Hakodate kaiyō kishōdai yōhō (Bulletin of the Hakodate Marine Observatory), No. 10:43-49 incl. illus., tables, maps, Dec. 1963. 7 refs.  
DLC, Orientalia Div.

Pack ice conditions are described based on reports from patrol ships, fishing vessels, and research ships from Dec. 1960 to June 1961. These reports were valuable aids in understanding the extraordinary ice conditions in the sea southeast of Hokkaido and in the Soya Strait. Sea-ice forecasts prevented serious damage to ships. Pack-ice distribution is mapped and the damages suffered by ships are tabulated. (Author's abstract, modified)

SIP 22775

551. 326. 7(+666)

Akagawa, Masaomi  
SEA ICE CONDITIONS IN THE NORTHERN OKHOTSK SEA DURING THE THAWING PERIOD; BASED ON REPORTS FROM THE JAPANESE LOADING FLEET FOR IMPORTING USSR HERRING. (Kaihyōki niokeru Ohotsuku kai hokubu no kaiyō jōkyō. Soren karano nishin tsumitori sendan no hōkoku o moto nishite; Text in Japanese with English summary). Hakodate kaiyō kishōdai yōhō (Bulletin of the Hakodate Marine Observatory), No. 10:54-64 incl. tables, maps, Dec. 1963. 10 refs.  
DLC, Orientalia Div.

Observations were made during May and June of 1960 and 1961 respectively. The fleet had a stormy voyage in 1960, encountering much pack ice in the sea off Cape Terpenija of Sakhalin and in the northern part of the Sea of Okhotsk. In 1961, pack ice was

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only encountered in Tauskoe Bay. The difference in the ice conditions was caused by the difference in the pressure patterns for the two years. In 1960, southeasterly winds prevailed, whereas north-north-westerly winds prevailed in 1961. The distribution of surface-water temperature and sea fog are also discussed. Pack ice distribution and the route of the observation fleet are mapped. (Author's abstract, modified)

SIP 22776

551.343(52)

Yamaguchi, A. and T. Kimura  
FROST HEAVE DAMAGE AND COUNTERMEASURES.  
(Daichi no tojō ni yoru higai to sono taisaku; Text in Japanese). Denki tsushin shisetsu (Electrical Communication, Construction and Maintenance), 15(7): 88-95 incl. illus., tables, graphs, diagrs., July 1963.

DLC, Orientalia Division

Research is summarized which was conducted on frost heave damage to electric poles, manholes, and paved roads in Hokkaido, Japan, from 1958 to 1961. A 10-cm-thick wet-soil model was frozen to -20 to -26°C and the pressure needed to prevent heaving was measured. The heaving pressure was 0.4 kg/cm<sup>2</sup> and is a function of the depth to which the soil is frozen. The cohesive force of the frozen soil was also measured. Steel, wood, and vinyl bars (2.2-2.7 cm in diameter) were buried in wet soil (50% water) which was subsequently frozen to -8°C. Resistance was measured while removing the bars at a constant speed. In a field test at Kushiro, Japan, total heaving force was measured using steel, concrete, and hard vinyl tubes (all 9 cm in diameter) buried 1 m below the earth surface. The result was: concrete, 1700-2000 kg; steel, 1000-2000 kg; and vinyl, 500-1800 kg. The countermeasures discussed include using soil with low capillarity, burying electric poles at depths below the soil freezing level, and strengthening the neck of the manholes. -- CST BLE

SIP 22777

016:5.001(\*464.2)

Hattersley-Smith, G.  
BIBLIOGRAPHY OF "OPERATION HAZEN," 1957-63.  
Rept. No. D Phys R(G), Hazen 20, Defence Res. Board (Can.), 5p., Jan. 1964.  
DLC, Tech. Rept. Collection

This bibliography lists 81 papers and reports, published or in press, which have resulted from field work on "Operation Hazen" up to the end of 1963. Many items of a general or preliminary nature are included, but manuscript reports have been excluded. Part I covers publications by authors working for the Defence Research Board or under a Defence Research Board contract with McGill University or the University of Toronto. Part II covers publications by

authors employed or supported by other government or private organizations. The bibliography provides a useful reference for future work in the Lake Hazen area and in northern Ellesmere Island generally. (Author's abstract, modified)

SIP 22778

551.326.85(\*531.251)

Nekrasov, I. A.  
ICE COVER ON THE EL'GYTKHYN LAKE. (Ledfano pokrov ozera El'gytkhyn; Text in Russian). Zapiski Chukotskogo Kraevedcheskogo Muzeia, Vyp. 3:8-10 incl. illus., graph, 1962. 4 refs.  
DLC, Slavic Div.

The formation of ice on El'gytkhyn Lake (Anadyr' Plateau, Chukot National District, Soviet Russia, Asia) and its physical structure are discussed. The ice formation begins in Sept. primarily in the shoals. According to measurements in April-May 1955, the thickest ice (2.02 m) was found 150 m from the eastern shore. The thickness diminished to 1.65 m at the center, 5000 m from the shore. Large hummocky ice accumulated along the southern lake side forming two parallel bars, one along the water line, the other along a 1-m isobath about 200-250 m from the water brink, both caused by surf and NW winds driving ice sludge and crust against the shore. The crystal clear ice of the entire area shows a prismatic granular structure, with heterogeneous gaseous content. At 300 m from the shore the ice has gas-filled transparent tubular hollows, 2-4 mm in diameter and a few millimeter to 10-15 cm long, running perpendicular to the ice surface. The process of ice disintegration toward the end of winter shows a formation of fine thermal fissures throughout the ice mass (up to the end of May), a deformation resulting in a wave-like ice formation, ice temperature change up to 0°C in the middle of June, formation of fissures of cylindrical wells, up to 30-80 cm in diameter and lifting of the remaining near-shore ice by water penetrating to the bottom. In cool summers the ice fails to melt completely and remains for the second year. -- ES/FMM

SIP 22779

551.578.71:539.16.06

Facy, L. and others  
THE STUDY OF THE FORMATION OF A HAILSTONE BY MEANS OF ISOTOPIC ANALYSIS. J. Geophys. Res. 68(13):3841-3848 incl. illus., tables, graphs, July 1, 1963. 14 refs.  
DLC, QC811.J6

The deuterium-hydrogen ratio of the water at various levels in a cloud can be computed from the pressure, temperature, and mean D/H ratio of the cloud, assuming that the condensed phase is in equilibrium with the vapor phase. A hailstone has been collected and the D/H ratio of the successive layers has been determined. From these values and the knowledge

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of the vertical structure of the atmosphere during the shower, the life history of the hailstone can be traced. The results of the isotopic analysis have also been compared with the photographic analysis of other hailstones collected from the same shower. A further exploration of the isotopic technique for the investigation of hail may lead to other important conclusions. (Authors' abstract)

SIP 22780 551.578.71:539.16.06

Bailey, I. H. and W. C. Macklin  
ON THE STUDY OF THE FORMATION OF HAIL-  
STONES BY MEANS OF ISOTOPIC ANALYSIS. J.  
Geophys. Res. 70(2):493-497 incl. table, graphs,  
Jan. 15, 1965. 13 refs.  
DLC, QC811. J6

Quantitative predictions are made concerning the up-  
draft required to support a hailstone on the basis of  
results obtained by Facy et al (1963) (SIP 22779), and  
the technique of studying hailstone formation by  
isotopic analysis is assessed. The calculations are  
based on Facy's assumption that the D/H ratio in an  
ice layer in a hailstone is the same as that in the  
cloud droplets at the level at which the layer was  
formed. This is not true, however, if the freezing  
time of an accreted droplet is longer than the time  
the droplet takes to reach a new isotopic equilibrium  
after the temperature rise which accompanies the  
freezing process. Due to this invariable warming of  
the droplet, its isotopic equilibrium with the sur-  
roundings is upset and its D/H ratio falls below the  
value of the condensed water at that particular level  
in the cloud. If the isotopic method of hailstone  
analysis is to be a useful technique, the relation be-  
tween the D/H ratio in a hailstone layer and that in  
the supercooled water droplets at the level in the  
cloud at which the layer was formed must be known.  
-- BLE

SIP 22781 624.042.42

Ostavnov, V. A. and L. S. Rosenberg  
IMPROVED METHOD OF DETERMINING SNOW  
COVER LOAD. (Usovershenstvovanie metodiki  
opredeleniya vesa snezhnogo pokrova; Text in Rus-  
sian). p. 64-73 incl. illus., tables, graphs, diagrs.  
(In: Metodika opredeleniya nagruzok na zdaniya i  
sooruzheniya, Moscow, Gostrolizdat, 1963). 6 refs.  
DLC, Slavic unclassified

Three methods are used for determining the snow  
cover load on the earth's surfaces. (1) The snow  
gauge method which is not sufficiently reliable be-  
cause the gauge cannot be adequately shielded from  
the wind and the possibility of liquid precipitation  
during thawing periods. (2) The fixed rod method  
by which daily height is observed and the density of  
snow determined. This method is not satisfactory  
because of wind effects. (3) The snow survey method

of periodical height and density observations at many  
points in a large area. This method is unsatisfactory  
because of wind action and time consuming proce-  
dures. An alternate method was successfully tested  
in the field near Moscow during the winters of 1960-  
61 and 1961-62. A 240 cm-square board placed on  
springs supported by four columns serves as a snow  
collector, the compression of the springs under the  
snow load being recorded by special measuring de-  
vices. The board is protected by a circular wooden  
screen 6 m in diameter and 3 m high with a wire  
mesh roof to provide further wind protection. Rods  
fixed on the board determine the snow cover thick-  
ness. Water accumulation on the board can be  
channeled into a container for measurement. --  
VDP/FMM

SIP 22782 624.145.6(\*50)

Korzhavin, K. N.  
ACTION OF ICE ON ENGINEERING STRUCTURES.  
(Vozdelstvie l'da na inzhenernye sooruzheniya; Text  
in Russian). Novosibirsk, Izd-vo Sibirskogo  
otdeleniya Akad. nauk SSSR, 1962. 202p. incl.  
illus., tables, graphs, diagrs. 209 refs.  
DLC, TA900. K6

Conditions of ice-breakup in the rivers of the Euro-  
pean part of the Soviet Union are described and com-  
pared with those of the Siberian rivers. The me-  
chanical action of ice-breaking devices integral to  
piers, abutments and other structures coming into  
contact with floating ice results in a shearing or  
bending stress in the ice, dependent on the V-shaped  
edge or rounded surface of the ice guards. Methods  
of computing the strength of ice under compression,  
cutting, bending and fracturing during the ice flow  
are offered and conversely methods are recom-  
mended for determining the strength of structural  
supports, taking into account the shape of the ice  
guards, load, size of ice packs, contact pressures,  
velocity of the flow, and the air temperature. The  
effect of the edge slope of the ice breakers is dis-  
cussed. Instead of costly inclining breakers, sup-  
ports with a sharp vertical profile can be used. A  
proposed method for the determination of the mini-  
mum permissible span of bridges or apertures in  
hydraulic structures insures a free flow of ice. --  
VDP/FMM

SIP 22783 693.5"324"(57)

Paramonov, G. A. and P. K. Sokolov  
CONSTRUCTION WORK DURING WINTER.  
(Stroitel'nye raboty zimoi; Text in Russian).  
Novosibirsk, Novosibirskoe Knizhnoe Izd-vo, 1963.  
242p. incl. illus., tables, graphs, diagrs., map.  
84 refs.  
DLC, TH153. P27

Features of the Siberian climate, frost penetration,

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physical and mechanical properties of frozen soils and effect on construction work are described. Methods and formulas for determining the depth of frost penetration are recommended. Frozen soils can be prepared for construction work by (1) thawing the soil with steam, hot water, electricity, burning fuel, or injection of chemical salts, (2) breaking-up, using explosives, scarifiers, bulldozers, or hammering wedges, and (3) trenching, using rotary excavators, bucket excavators, chain or rotary saws. The equipment necessary for these operations is described and illustrated. The effect of freezing temperatures on the setting and hardening of concrete is discussed and precautionary measures for the preparation and the transportation of concrete mixes are recommended. Concrete curing by preheating the mix and forms or by using chemical additives such as calcium or sodium chlorides are described. Electric heat probes inserted directly into the concrete or blanket-type heating around the concrete forms by steam or warm air are discussed and illustrated. An evaluation is made of the stone masonry techniques. -- VDP

SIP 22785

551.506:551.58(+464.2)

Barry, R. G.  
WEATHER CONDITIONS AT TANQUARY FIORD, SUMMER 1963. Rept. No. D. Phys R(G) Hazen 23, Defence Res. Board (Can.), [36 p. incl. illus., tables, graphs, diagrs., map, Sept. 1964. 16 refs. DLC, Tech. Rept. Collection

Data are presented concerning general synoptic conditions, wind, air temperature, soil temperature, temperature and ice melt, clouds and precipitation, and radiation. Information is also given on the methods and instruments used, and the calibration of the radiation instruments. The primary feature of the climate of the station in summer is the wind regime with its effects on temperature and humidity conditions. The high maximum temperatures that occur at the station indicate that it may be one of the warmest coastal localities on Ellesmere Island. Accumulated temperatures appear to confirm previous work on sea-ice decay, although further studies of radiation relations are necessary. The radiation and albedo data over the delta show general agreement with other studies and afford a basis for continued investigation. The station site is comparatively favorable in this respect until early Aug. -- BLE

SIP 22784

624.139:622.4(+531.3)

Zil'berbord, A. F.  
THERMAL REGIME OF MINES IN PERMAFROST AREAS. (Teplovoy rezhim shakht v oblasti rasprostraneniya mnogoletnemerzlykh gornykh porod; Text in Russian). Moscow, Izd-vo Akad. nauk SSSR, 1963. 94p. incl. illus., tables, graphs. 74 refs.

DLC, TN292. Z5

A brief outline of the permafrost and geological characteristics of the northeastern regions of the USSR is presented. Observations carried out in mining operations of the Yakutsk Council of People's Economy and the Arctic Coal Trust are correlated to the thermal regime of mines, a determining factor in the stability and deformation of underground excavations. A cool zone which is dependent on the size of operation and the extent of rock mass is created around the excavations and has reached a depth of several thousand meters in a series of cases. Formulas for a hydraulic analogy computation of the thermal regime are given and a practical example described. To compensate for varying conditions during the cold season and summer months a system of air conditioning is proposed using natural heat exchange and periodic water spraying. Formulas are given to determine the size of the surface to be sprayed, the periodicity of the sprayings, velocity of air movement and temperature values. -- VDP FMM

SIP 22786

551.5:551.32:551.46:5.001(+464.2)

Hattersley-Smith, G. and others  
OPERATION TANQUARY: PRELIMINARY REPORT, 1963. Rept. No. D Phys R(G) Hazen 22, Defence Res. Board (Can.), [42 p. incl. illus., tables, graph, diagr., map, Sept. 1964. 11 refs. DLC, Tech. Rept. Collection

This report discusses Operation Tanquary, a new field station established in 1963 by the Defence Research Board of Canada on the west coast of northern Ellesmere Island at the head of Tanquary Fiord. The operation is summarized and a diary is presented of the main events from May to Aug. 1963. Five preliminary reports are presented on meteorology, oceanography, tidal observations, glaciology, and a glacier-movement survey. The results of other studies (archeology, wildlife, botany) are summarized in the last section. For the glaciology and glacier-movement survey papers see SIP 22787 and 22788. -- BLE

SIP 22787

551.334(+464.2)

Hattersley-Smith, G.  
OPERATION TANQUARY: PRELIMINARY REPORT, 1963. Glaciology. Rept. No. D Phys R(G) Hazen 22, Defence Res. Board (Can.), p. 22-27 incl. illus., tables, Sept. 1964. DLC, Tech. Rept. Collection

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Glaciological studies were made during the spring and summer on the central ice cap, on valley glaciers near the head of Tanquary Fiord, on the Ward Hunt Ice Shelf, and on the sea ice at the head of Tanquary Fiord. Measurements of snow cover and sea ice thickness, and observations of glacier termini were also made over the inner part of the Greely Fiord system (See SIP 22788). For the first time since 1957, when observations were started, the snow pack on Gilman Glacier was completely dry above an elevation of 1550 m. Exceptionally low accumulation and high ablation for the 1961-62 budget year were evident from pit studies and ablation measurements. Mean snow accumulation on the Ward Hunt Ice Shelf was 36 cm or about 29 cm water equivalent, and on the ice rise, 81 cm or 21 cm water equivalent. In the fiords on level winter ice, the snow cover varied from 3 to 29 cm with depths up to 1 m in the rough pack ice. Winter ice thicknesses ranging from 2.05 to 2.57 m were recorded on the spring traverse. The ice increased in thickness until the second week of June. The average rate of sea ice melt from July 5 to 21 was 5.2 cm/day. During a flight from Emma Fiord to Tanquary Fiord, special note was made of the highly crevassed surface of the lower 20 km of the large outlet glacier at the head of Otto Fiord. This is probably the most active glacier in the area at the present time. -- BLE

SIP 22788

551.324.54(\*464.2)

Cleary, N. F.  
OPERATION TANQUARY: PRELIMINARY REPORT, 1963. SURVEY. Rept. No. D Phys R(G) Hazen 22, Defence Res. Board (Can.), p. 28-29 incl. illus., table, Sept. 1964.

DLC, Tech. Rept. Collection

Movement studies were carried out on four small valley glaciers near the head of Tanquary Fiord (See SIP 22787). Glaciers "A" and "B" flow down steeply from the Viking Ice Cap into the northeast valley which leads toward Ekblaw Lake. Glacier "C," which can be clearly seen from the fiord, flows from a cirque on high land between the northeast and north rivers. Glacier "D" is situated on the northwest side of the fiord almost opposite the main station. This paper discusses the surveying methods, which included the use of poles, theodolites, cairns, and photographs for stereo-coverage. Elevation and movement data are tabulated. -- BLE

SIP 22789

551.331.4(719)

Ives, J. D. and R. P. Kirby  
FLUVIOGLACIAL EROSION NEAR KNOB LAKE, CENTRAL QUEBEC-LABRADOR, CANADA: DISCUSSION. Bull. Geol. Soc. Amer. 75(9):917-922 incl. illus., map, Sept. 1964. 32 refs.  
DLC, QE1.G2

Derbyshire's paper (SIP 21080) under the above title is discussed with emphasis on his proposed classification of glacial-drainage-channel forms. The present authors studied the glacial geomorphology of the Schefferville region in 1955 and between 1957 and 1960. Although Derbyshire's classification is stated to be a genetic one, based on morphology, disposition to local slope, and related deposits, other important factors should be considered such as glacial-meltwater erosional features and the channel position relative to the melting ice mass. The bedrock structures closely control the topography and exert strong lithological influence on the morphology of water-cut glacial features. Genetic classification around morphology should consider details of the preglacial landscape. Difficulties implicit in identifying the functions of glacial-drainage channels are pointed out but the theories explaining the morphologies of particular channels are in themselves suspect. In view of the complexity of the field area, the degree of bedrock and pre-Wisconsin (or preglacial) topographic control on channel form, the absence of various types of channels, and the difficulty of exact differentiation of forms, it seems premature to extend a classification for the Schefferville area into a general classification. Some channels of the present day and immediate past are discussed. -- BLE

SIP 22790

551.331.4(719)

Derbyshire, Edward  
FLUVIOGLACIAL EROSION NEAR KNOB LAKE, CENTRAL QUEBEC-LABRADOR, CANADA: REPLY. Bull. Geol. Soc. Amer. 75(9):923-925, Sept. 1964. 8 refs.  
DLC, QE1.G2

In reply to Ives' comments (SIP 22789) about Derbyshire's paper (SIP 21080) under the above title, it is pointed out that the proposed genetic classification of glacial-drainage channel forms is derived from its predecessors and no finality is intended or implied. The possibility that some of the channels developed in a previous period of deglaciation was rejected at an early stage on the basis of the small size and perfection of form of most channels, the consistency of the regional flow pattern in a broad zone on all sides of Irony Ridge, and the intimate relationship between channel outlet, local slope, and fluvio-glacial outwash deposits beneath the till. A late-glacial origin for the channels is assumed by Ives (1959; 1960) without qualification. The author is aware of difficulties of estimating annual downwastage of ice from marginal evidence and the varying viewpoints expressed in the literature. The marginal benches were the only evidence considered free from most objections. "Great regularity" of vertical spacing has not been claimed. The main weakness of the classification is its failure to provide for the identification of strictly marginal channels in areas of former ice cover. It is inconceivable that a single genetic classification of these forms can do more than provide a working framework with which to test new areas. -- BLE



# CRRRL BIBLIOGRAPHY

SIP 22791

551.578.46:536.2

Yen, Yin-Chao

HEAT TRANSFER CHARACTERISTICS OF VENTILATED SNOW. Res. Rept. 106, U. S. Army Cold Regions Research and Engineering Laboratory, 18p. Incl. illus., tables, graphs, diagrs., appendixes A, B, and C. Jan. 1965. 4 refs.

CRRRL files

A method of evaluating the effect of air flow on the rate of heat transfer due to vapor transfer is developed. Cold room snow samples screened for densities of 0.376 to 0.472 gm. cu cm were used in snow beds where measurements of the steady-state temperature distribution were taken and the weight loss of the snow sample obtained at the completion of each experimental run. The essential part of the experimental apparatus is shown. (See also SIP 21376). The experimental technique consists of determining the effective diffusivity of water vapor through snow, which is subsequently used to calculate the contribution of heat transfer through the mechanism of vapor diffusion. The resultant equivalent thermal conductivity of snow due to vapor transfer ( $k_v$  in cal cm - C - sec) is represented in terms of air flow rates, ranging from about 2 to 40 x 10<sup>-4</sup> gm sq cm-sec. When there is no air flow through snow,  $k_v$  contributes about 7.5% of the total value of the effective thermal conductivity of snow ( $k_e$ ). For air flow rate of 10 x 10<sup>-4</sup> gm sq cm-sec or for a pore velocity of about 1.3 cm/sec,  $k_v$  is about 19% of  $k_e$ . Vapor transfer hence, significantly affects the processes of heat transfer in a natural snow cover. (Author's abstract)

SIP 22792

551.322:548.51:541.183.55

Sano, I. and others

ADSORPTION STUDIES ON THE MECHANISM OF ICE NUCLEATION. J. Meteorol. Soc. Japan, Ser. 2, 41(4):189-196 incl. tables, graphs, Aug. 1963. 11 refs.

DLC, Orientalia Div.

The adsorption of water vapor was measured at several constant temperatures from 0° to -15°C on the oxides of zinc, cadmium, nickel and copper by a weighing method. The isotherms obtained are all of the sigmoid nature, but with some step-wise discontinuities. The heats of adsorption were calculated from the isotherms, those of the first to second layer being found higher than those of the next few layers which approached the heat of condensation of water vapor. The data are discussed in terms of two-dimensional transitions of state, taking into consideration the interaction effects between adsorbed water molecules together with the adsorption forces of the solid surface toward the layers of adsorbed water molecules. It is concluded that (1) there has only to exist an adsorption layer of water 2 molecules thick for the ice-embryo formation to be realized on the surface of a substance having water affinity such as an oxide, and (2) if the adsorption forces are too

powerful and cause the heat of adsorption of the first layer to be high, the effect might be adverse for ice nucleation. Until the adsorbed water molecules acquire a certain degree of freedom of movement permitting them to nucleate ice, layers accumulate under them, cutting off the work of the substrate. (Authors' abstract, modified)

SIP 22793

551.578.4:551.594.25

Magono, Choji and Tsutomu Takahashi

EXPERIMENTAL STUDIES ON THE MECHANISM OF ELECTRIFICATION OF GRAUPEL PELLETS. J. Meteorol. Soc. Japan, Ser. 2, 41(4):197-210 incl. illus., table, graphs, diagrs., Aug. 1963. 12 refs.

DLC, Orientalia Div.

Measurements of electric charge on a riming probe (an ice-coated metal rod) were made during the collision of supercooled droplets and ice particles with the probe under various conditions in a cold chamber. The apparatus, measuring system, and experimental procedures are described. Concerning the electrification, the following points were noted: (1) When the riming rate is high under favorable conditions, tearing off of fine structures of rime from the probe's surface is significant. (2) When temperature is relatively warm, e.g., warmer than -10°C, tearing off of liquid-like film from the riming surface is effective. In the light of these mechanisms, local positive space charge in the lower part of thunderclouds and the field pattern of the wave type are explained. The most important factor in the electrification of the probe were temperature, temperature difference between the probe and ice particles, and the riming rate. (Authors' abstract, modified)

SIP 22794

551.578.4:551.594

Magono, Choji and Ken-ichi Sakurai

ON THE ELECTRIC CHARGE ON DRIFTING SNOW PELLETS. J. Meteorol. Soc. Japan, Ser. 2, 41(4):211-217 incl. illus., table, graphs, diagrs., Aug. 1963. 6 refs.

DLC, Orientalia Div.

Vertical profiles of the electric potential near the surface of snow cover were observed in falling snow at Mt. Teine. The charge on snow pellets (including ice fragments) were measured by means of the following two methods. (1) A direct measurement was made of the potential rise due to the fall of charged snow pellets on a measuring plate. This was used as a supplementary method because of the difficulty of catching the pellets on the plate in blizzards. (2) With an indirect method, the vertical profile of electric potential was measured, and the

# CRREL BIBLIOGRAPHY

space charge due to pellets suspended in air was calculated from the gradient of the potential. The following vertical distribution of space charge near the surface was ascertained: a large positive space charge was distributed near the surface, a negative space charge was present at about 80 cm above the surface, and a small positive charge existed at levels higher than 1 m. These space charges resulted from the impact of snow pellets on one another, and were carried on larger snow pellets, smaller snow pellets, and ions, respectively, from near the surface to the higher levels. The observations help explain the results obtained by Simpson, Kähler and Dorno, Yoshida and Ōta. -- BLE

SIP 22795 551.465.535:525.623:551.326.1(\*3+.7)

Maksimov, I. V.  
FEATURES OF ASTRONOMICAL VARIATIONS OF OCEANIC CURRENTS. (O kharaktere astronomicheskikh variatsii okeanskikh techenii; Text in Russian). Okeanologiya, 3(2):193-199 incl. graphs, maps, 1963. 6 refs.  
DLC, GCI. A47A23

The complex semimonthly and monthly astronomical currents associated with the fundamental waves of long period solar and lunar tides are examined for different regions of the ocean. Graphs and maps are presented showing the semimonthly variation of the velocity of (1) the Gulf Stream along the coast of North America; (2) the drift of ice in the central Arctic Ocean; (3) the drift of ice in the Weddell Sea; and the semi-annual variation of the velocity of currents in the Gulf Stream zone. The long period variation of oceanic currents is primarily a middle latitude phenomenon. As a result of the influence of the semi-annual astronomical current, northward flowing currents are most developed in March and Sept. and least developed in July and Dec. While the velocities of these astronomical currents are small, their periods play an important role in the formation of large semimonthly internal waves observed in the Atlantic Ocean and the Baltic Sea, and possibly play a role in the bottom oceanic currents. -- Meteorol. and Geostrophys. Abstracts, modified

SIP 22796 551.464:551.322:548.5

Kawasaki, S., H. Komizu and T. Uchida  
STUDIES ON SALINE WATER CONVERSION BY FREEZING METHOD (IV). CRYSTALLIZATION OF ICE CRYSTALS IN SEA WATER (I). EFFECT OF INITIAL SUPERCOOLING DEGREE AND ROTATIONAL SPEED OF STIRRER. (Reitohō ni yoru ensui tenkan ni kansuru kenkyū (dai 4 hō) kaisuichū ni shōshutsu suru hyōkesshō ni tsuite (I) shoki kareikyakudo to kakimaze sokudo no eikyō; Text in Japanese with English summary). Tōkyō Kōgyō Shikensho hōkoku (Rept. of the Govt. Chemical Res. Inst.), 53(8):388-395 incl. illus., tables, graphs, diacr., Aug. 1964. 12 refs.  
DLC, Orientalia Div.

When ice crystals are formed by seeding in agitated supercooled sea water, the temperature of sea water rises up to its freezing point, because of the release of latent heat of crystallization. By analysis of the temperature-time curve, the relation between the crystallizing rate ( $V$  g. sec.  $\cdot$  g.  $\cdot$  100 g sea water) of ice and the supercooling ( $\theta$ °C) of sea water at the stirring speed of 500 rpm was obtained as follows: (1) in the range of supercooling from 0.1 to 0.4°C,  $V = 2.5 \theta^{2.1}$ , (2) in the range from 0.4 to 1.0°C,  $V = 1.3 \theta^{1.5}$ . These relations were not affected by initial supercooling temperature, but greatly affected by stirring speed. The crystallizing rate was mainly controlled by the formation of crystal nuclei and the growth of the parallel plane to c-axis supercooling from 0.4 to 1.0°C, and by the growth of the parallel plane to c-axis in the 0.1 to 0.4°C range. The crystallization of ice crystals formed in agitated sea water is controlled by the interphase temperature between ice crystal and sea water. (Authors' abstract, modified)

SIP 22797 551.467.3(26)

Nazarov, V. S.  
AMOUNT OF ICE IN THE WORLD'S OCEANS AND ITS VARIATION. (Kolichestvo l'dov mirovogo okeana i ikh izmereniya; Text in Russian). Okeanologiya, 3(2):243-249, incl. tables, graphs, 1963. 6 refs.  
DLC, GCI. A47A23

An outline is given of the various ways in which sea ice is accumulated and distributed in the world's oceans by water and air currents, sediments, condensation and freezing of air moisture, and snow. The growth of sea ice due to snow occurs mainly in the Southern Hemisphere and in the Northern where there are sharply defined atmospheric frontal zones. The method used in calculating the area, volume and solidity of sea ice is given; mean, maximum, and minimum values were calculated. A comparison of Arctic and Antarctic sea ice is summarized in a table. The formation and melting of ice each year is significantly less in the Arctic than in the Antarctic (by area: 2 times as much growth and melting in the Antarctic; by volume: 1-1.2 times); this difference correlates with the difference in mean annual temperatures for each region. Values for the worldwide sea ice variation and balance are given and the relation of solar activity to these factors is discussed. -- SKM

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SIP 22798 550. 831-550. 834:551. 324. 28(\*744.\*745)

Frakernik, V. B., A. I. Frolov and P. A. Stroeve  
SEISMIC AND GRAVIMETRIC INVESTIGATIONS ON  
THE WEST ICE SHELF OF THE ANTARCTIC CON-  
TINENT. (Seismicheskie i gravimetricheskie  
issledovaniia na zapadnom shel'fovom lednike v  
Antarktide; Text in Russian). Akad. nauk SSSR.  
Izv., Ser. geofiz. No. 6:90\*-921 incl. tables,  
diags., maps. June 1963. 5 refs. (Eng. transl.  
in: Acad. Sci. USSR. Bull., Geophys. Ser., No. 6:  
558-565, June 1963).

DLC, QC801. A35; QC801. A353

The structure of the West Ice Shelf is described and obtained from seismic and gravimetric readings. The seismic survey gives information on the bottom depth, ice shelf thickness, and structure of the upper snow-firn layers. The main seismic method used was reflection, taken with a portable seismic station and recorded on magnetic tape. The limitations of the surveys and subsequent conclusions are pointed out. The gravimetric method in conjunction with seismic data gives information on the subglacial relief and deep geologic structure of the West Ice Shelf. Free-air and Bouguer corrections were used in calculating gravity anomalies. The gravity fields to an extent reflect subglacial topography. The thickness of the earth's crust in this area varies considerably. The cross sections show most bedrock to be below sea level and where there are bedrock rises there are usually ice shelf rises (ice caps). The greater part of the ice shelf was shown to be floating. -- SKM

SIP 22800

551. 326(\*84)

Buñitskii, V. Kh.  
ICE RESEARCH. (Ledoissledovatel'skie raboty;  
Text in Russian). Sovet. Antarkticheskai Eksped.,  
Trudy, 20:114-140, incl. illus., tables, graph,  
maps, 1962. 1 ref.  
DLC, G860. S63

The basic program of ice research during the fourth expedition of the Ob' consisted of the following: (1) observations from the ship of the general character, form, age, closeness, thickness, roughness, and snow-encrustation of sea ice, including erosion, location of ice edges, and ice permeability; (2) observations of the character, strength, and distribution of shore ice, (3) observations of the number, appearance, and dimensions of icebergs; (4) exploration of the ice shelf in the Lazarev Station region; (5) photoradar survey along the ship's route; and (6) laboratory research of the forms of sea and shore ice for the purpose of studying their physical and chemical characteristics. The tendency for Antarctic ice to be unstable, granular, and spongy is contrasted to that of the Arctic and is caused mainly by the particular biogenous and meteorological conditions of the Antarctic; the biogenous factor is also the reason that Antarctic ice melts from below, whereas Arctic ice melts from above. The importance of observation, study, and reclassification of icebergs is stressed. -- SKM

SIP 22799

551. 326. 12(\*80)

Eskin, L. I. and V. G. Ledenev  
ICE OBSERVATIONS AND RADAR SURVEY OF ICE-  
BERGS IN THE ANTARCTIC OCEAN. (Ledovye  
nabludeniiia i radiolokaitsionnaia s'ematka kolichestva  
alsbergov v Ruzhnovn okeane; Text in Russian).  
Sovet. Antarkticheskai Eksped., Trudy, 20:252-  
265 incl. illus., table, maps, 1962.  
DLC, G860. S63

Information on Antarctic ice conditions was gathered during the fifth voyage of the Ob' using ship and air observations, and radar surveys in the region eastward from 12°E to 90°W. The observations were mainly for the purpose of describing shore ice conditions for the 1959-60 summer near Lazarev, Showa, Mawson, and Mirnyy Stations. The radar survey served to locate large areas of icebergs and their paths of movement to the open sea. The discovery of a colony of emperor penguins on the Lazarev Ice Shelf is noted. -- SKM

SIP 22801

551. 326. 7:539. 3(\*84)

Serikov, M. I.  
STUDY OF THE PHYSICAL AND MECHANICAL PRO-  
PERTIES OF SEA ICE. (Izuchenie fiziko-mekhani-  
cheskikh svoistv morskikh l'dov; Text in Russian).  
Sovet. Antarkticheskai Eksped., Trudy, 20:155-  
164 incl. illus., tables, graph, diags., 1962.  
DLC, G860. S63

A summary is given of laboratory research done on sea ice during the fourth expedition of the Ob' to determine ice density, salinity, resistance to bending, shearing stress and compression, toughness, and elasticity. The methods and apparatus used are described and the formulas used in computation of results are noted. The location of test areas, the data collected and the results for each ice property are summarized in tables. It was found that density increases from the surface to depths of 40-50 cm and decreases from 50-90 cm. The surface ice at Mirnyy is highly saline. Antarctic ice in the areas tested is less elastic than Arctic ice; durability, however, is about the same for both under similar climatic conditions. -- SKM

# CKREL BIBLIOGRAPHY

SIP 22802

551. 467.551. 465 45(\*80)

Treshnikov, A. F.  
**PECULIARITIES OF ICE CONDITIONS OF THE ANT-  
 ARCTIC OCEAN.** (Osobnnoosti ledovogo rezhima  
 Ruzhnogo ledovitogo okeana, Text in Russian). Sovet  
 Antarkticheskaya Eksped., Trudy, 21:5-62 incl.  
 tables, graphs, maps, 1963. 128 refs.  
 DLC, G860. S63

A brief history is presented of Antarctic expeditions  
 and their discovery, classification, and description  
 of ice formations. Summaries of ice observations  
 made during recent Soviet Antarctic Expeditions in-  
 clude discussions of sea ice, shore ice, icebergs,  
 polynyas, drift of sea ice and icebergs, and the  
 physical and mechanical properties of Antarctic ice.  
 Comparisons are made of Antarctic and Arctic ice  
 and subsequent shipping problems encountered in  
 each area; Arctic ice lasts longer than Antarctic ice.  
 The causes and effects of the formation of bottom  
 ice in the Antarctic, and of cold near-bottom water  
 and its movement in the deep water channel around  
 the continent and subsequently to the equator are  
 discussed, as well as the northward drift of ice-  
 bergs and water circulation around Antarctica.  
 (Appendixes by V. I. Shil'nikov and A. F.  
 Treshnikov are abstracted separately as SIP 22803  
 and 22804). -- SKM

SIP 22803

551. 46. 062. 7(\*80)

Shil'nikov, V. I.  
**OBSERVATIONS ON SEA ICE AND ICEBERGS DUR-  
 ING THE ANTARCTIC CRUISES OF THE D/E  
 "LENA" (1957), T/KH "KOOPERATSIYA" (1957),  
 AND THE D/E "OB" (1957/58).** (Nabliudeniya nad  
 morskimi ledami i alsbergami vo vremya antarkticheskikh  
 reysov d/e "Lena" (1957 g.), t/kh  
 "Kooperatsiya" (1957 g.) i d/e "Ob" (1957/58 g.);  
 Text in Russian). Sovet. Antarkticheskaya Eksped.,  
 Trudy, 21:64-118, incl. tables, graphs, maps,  
 1963. 1 ref.  
 DLC, G860. S63

Descriptions are given of methods and apparatus used  
 in observing sea ice and icebergs. The methods used  
 in determining the dimensions, locations, and drift  
 of icebergs and sea ice include instrumental, naviga-  
 tional, and visual. The measurements were made  
 from a ship standing near the shore ice and from a  
 drifting ship. The method of determining the height  
 of an iceberg when the distance to it exceeds the dis-  
 tance of the visible horizon is described. -- SKM

SIP 22804

551. 461. 062. 7(\*80)

Treshnikov, A. F.  
**OBSERVATIONS ON THE DISTRIBUTION OF ICE IN  
 THE ANTARCTIC OCEAN FROM SHIP BOARD AND  
 FROM AIRPLANES OF THE SOVIET ANTARCTIC  
 EXPEDITIONS, 1956-1958.** (Nabliudeniya nad  
 raspredeleniem l'dov v Ruzhnom Ledovitom okeane,  
 vypolnennye s korta sud i s samoletov sovetskikh  
 antarkticheskikh ekspeditsiy v 1956-1958 gg.; Text in  
 Russian). Sovet. Antarkticheskaya Eksped., Trudy,  
 21:120-237 incl. illus., diagrs., maps, 1963.  
 DLC, G860. S63

A series of maps arranged in chronological order is  
 presented showing ice conditions in the east longi-  
 tudes of Antarctic waters. Thirty-six map symbols  
 are used to show the ice conditions with photographs  
 of some examples. -- SKM/FMM

SIP 22805

551. 32(\*613)

Schytt, Valter  
**SCIENTIFIC RESULTS OF THE SWEDISH GLACIO-  
 LOGICAL EXPEDITION TO NORDAUSTLANDET,  
 SPITSBERGEN, 1957 AND 1958.** Geografiska  
 Annaler, 46(3):243-281 incl. illus., tables, graphs,  
 diagrs., maps, 1964. 21 refs.  
 DLC, G25. G4

The scientific program of the expedition included (1)  
 an investigation into the regime of the Nordaustlandet  
 ice caps (the main task of the expedition), (2) a study  
 of the temperature conditions in the snow, firn, and  
 ice, especially in regard to the formation of different  
 types of ice, (3) a seismic investigation of the thick-  
 ness of the 3 ice caps, and (4) a study of the glacial  
 history of Nordaustlandet. The discussion also in-  
 cludes the rapid formation of fog deposits in this  
 area, navigation, and altimetry. Extensive data are  
 given. -- BLE

SIP 22806

551. 324. 83:551. 322(\*548)

Ostrem, Gunnar  
**ICE-CORED MORAINES IN SCANDINAVIA.** Geo-  
 grafiska Annaler, 46(3):282-337 incl. illus., graphs,  
 tables, maps, 1964. 42 refs.  
 DLC, G25. G4

This paper discusses the occurrence of ice-cored  
 moraines, methods for their identification, and their  
 distribution in Scandinavia. A special study was  
 made concerning the possible relationship between  
 the regional distribution of ice-cored moraines and  
 the altitude of temporary snow lines as well as other  
 parameters. Methods of determining the altitudes of  
 temporary snow-lines found on aerial photographs  
 are discussed. The field investigations included  
 geo-electrical-resistivity measurements, seismic  
 soundings, digging pits in the moraine ridges, drill-  
 ing, mapping of the ice-cored moraines, and analyses

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of grain size and water content in the till. It is concluded that the ice-cored moraines were formed during periods when the glacier was stationary or slowly advancing over the crest of an end moraine. When the moraine cover has grown thick enough, it will form an insulating layer, thus conserving the buried snow-bank. The largest proportion of ice-cored moraines was found in areas with the highest glaciation limits. The continental climate in these areas is assumed to promote the formation and conservation of ice-cored moraines. -- BLE

SIP 22807

551. 332. 2(\*55)

Hoppe, Gunnar and Stig-Rune Ekman  
A NOTE ON THE ALLUVIAL FANS OF LADT-JOVAGGE, SWEDISH LAPLAND. *Geografiska Annaler*, 46(3):338-342 incl. graphs, maps, 1964. 4 refs.

DLC, G25, G4

Ladtjovagge valley, leading to the alpine Kebnekaise district, contains many features formed during deglaciation, making it possible to trace the course of the retreating glaciers and their activity. Numerous lateral drainage channels slope toward the east on both sides of the valley indicating that the ice-front retreated toward the west. The drainage channels also help in the understanding of the relationships between glacier tongues in different valleys. Both outwash plains and short segments of eskers occur on the valley bottom. Lake Ladtjojaure has been about half filled by a delta built up by material from the receding remnants of the inland-ice and from the present-day glaciers. The Tjeurajakka fan (the largest in Ladtjovagge) consists of two parts, a higher one to the west and a lower, larger one to the east. Seismic profiles of the fan are discussed and presented. -- BLE

SIP 22808

551. 312. 2.551. 341:622. 233(\*55)

Forsgren, Bernt  
NOTES ON SOME METHODS TRIED IN THE STUDY OF PALSAS. *Geografiska Annaler*, 46(3):343-344 incl. graphs. 1964. 1 ref.

DLC, G25, G4

As an introduction to a study of palsas (low hummocks with cores of frozen peat and ice in alternating layers), methodological studies were carried out during the 1963 summer near Karesuando, Swedish Lapland. The tests included sawing through a palsa with a motor-saw to get vertical sections, drilling with different types of drills, and placing thermistors for temperature measurements. Two corers were used. The slightly modified SIPRE corer should be modified further for future use because the core catcher was too small to take up the cores from the drilled hole. The core catcher also showed a tendency

to be blocked up by peat in the spring mechanism which forces them into the core when the drill is rotated backwards. With the other drill (which has been used to drill 1-1.2 in. holes in glaciers and consists of a steel pipe with saw-teeth cut out at the lower end), it was difficult to get the cores out of the drill before they began to melt. However, this drill is not designed for coring. Both drills were used to place the thermistors. This was done by drilling a hole in the palsa, removing the cores, placing the thermistor in the hole to the desired depth, and then replacing the cores. With these thermistors, the temperature distribution in different parts of the palsa are recorded twice a month. -- BLE

SIP 22809

551. 576. 462(52)

Toshida, Sakumatsu  
HYDROMETEOROLOGICAL STUDY ON SNOW MELT (Yusetsu no kenkyu; Text in Japanese with English abstract). *Kishocho kenkyu joho* (J. Meteorological Res.), 14(12):17-37 incl. illus., tables, graphs, diagrs., Dec. 1962. 27 refs.

DLC, Orientalia Div.

Results are given of observations made in the upper region of the Tadami River, Japan, during the winters of 1957 and 1958. In an open field, it is possible to estimate the turbulent exchange of heat energy and vapor between air and snow surface with the formula for the neutral stability condition of air with the ordinary observational values of temperature, humidity, and wind speed (above 1 m/sec). From observations made during March and April, factors contributing to snow melt were estimated as follows: absorbed short wave radiation, 60-70%; turbulent heat exchange 40-50%; turbulent exchange of vapor, 20%; and effective long wave radiation, 30%. The ratio of the daily amount of effective out-going long wave radiation to that of absorbed short wave radiation is 0.3 to 0.7, regardless of the weather condition. As a practical index of snow melt in large areas, "the effective degree day" is introduced. It is defined as the daily mean of the positive departure of hourly temperature from 0°C and is closely related to the turbulent exchange of heat and short wave radiation. It is also related to the turbulent exchange of vapor and long wave radiation. The ratio of snow melt to the effective degree day is 0.4 to 0.8 gm/cm<sup>2</sup>/degree day and varies from place to place, season to season, and year to year. A chart was made for estimating the effective degree day with ordinary air-temperature data, the lapse rate of an effective degree day was studied, and the thermal conductivity of soil under snow was measured. (Author's abstract, modified)

# CRRREL BIBLIOGRAPHY

SIP 22810

551. 342(\*548)

Wiman, Sten

A PRELIMINARY STUDY OF EXPERIMENTAL FROST WEATHERING. *Geografiska Annaler*, 45 (2/3):113-121 incl. illus., tables, graphs, 1963. 13 refs.

DLC, G25. G4

The intensity of the mechanical disintegration and the types of weathering products formed were studied when selected pieces of Scandinavian rocks were frozen and thawed in wet and dry environments under continuous temperature-controlled conditions. Methods and temperature conditions were chosen in accordance with the experiments made by Tricart (SIP 14797). The samples weighed 22 to 305 gm and included slate, black mica schist, granite, quartzite, and gneiss. The experimental equipment and procedure are described. The slight weathering obtained experimentally was dependent on the water content of the rock pieces. No weathering was obtained in dry environments. The number of changes around 0°C seems to have been especially important. A relation was noted between the weathered portions of each rock type and grain-size distribution (partly independent of the temperature conditions) and porosity. Further experiments are necessary. -- BLE

SIP 22811

551. 332. 5(\*58)

Dahl, Ragnar

SHIFTING ICE CULMINATION, ALTERNATING ICE COVERING AND AMBULANT REFUGE ORGANISMS? *Geografiska Annaler*, 45(2/3):122-138 incl. illus., graphs, maps, 1963. 30 refs.

DLC, G25. G4

Information is presented that may throw more light upon the extension of the last glaciation in northern Norway. The investigations were conducted in the Skjomen area which is situated between the Ofotenfjord and the Swedish-Norwegian frontier. The discussion includes the weathering forms and materials in the area, erratic blocks and their value as proof of former glaciation, the upper limit of distinct ice-abrasion marks, and alternating ice covering and ambulant refuge organisms. -- BLE

SIP 22812

551. 578. 463:551. 583(\*464. 2)

Hattersley-Smith, G.

CLIMATIC INFERENCES FROM FIRN STUDIES IN NORTHERN ELLESMERE ISLAND. *Geografiska Annaler*, 45(2/3):139-151 incl. illus., graphs, diagrs., 1963. 15 refs.

DLC, G25. G4

Detailed glaciological and meteorological studies were resumed on the Gilman Glacier and the adjoining

ing ice cap from mid-May to mid-Aug. 1961. Emphasis was placed on studies of firn stratigraphy and heat-balance measurements on the summit of the ice cap. Results of the stratigraphic studies are related to possible climatic changes in recent decades. The main accumulation area of the Gilman Glacier is situated at an average elevation of 1550 m but its highest névé lies at over 1800 m. The mass balance of the glacier was negative for the 1957-58 budget year. The deficit was 60% of the total net accumulation. The firn stratigraphy is described at an elevation which is close to the boundary between the dry-snow and the percolation facies. Evidence of increased summer melting on the ice cap in the last 35 yr is correlated with an increase of mean summer temperatures up to 2°C at Upernivik to show that the climatic warming of the late 1920's and 1930's in central west Greenland and elsewhere also affected northern Ellesmere Island. -- BLE

SIP 22813

551. 332. 52:551. 337(\*423)

Andrews, J. T.

END MORAINES AND LATE-GLACIAL CHRONOLOGY IN THE NORTHERN NAIN-OKAK SECTION OF THE LABRADOR COAST. *Geografiska Annaler*, 45 (2/3):158-171 incl. illus., graphs, diagrs., maps, 1963. 19 refs.

DLC, G25. G4

This paper discusses the physiographic characteristics of the area of investigation, the survey methods, previous observations, and ice movement during the Saglek glaciation in the Nain-Okak section. The location and description of the various end moraine systems are given with particular emphasis on the Tikkigatsiak Island, Tasiuyak Tasiakua, and Umiakoviarsuk moraines. The significance and correlation of the moraines and the sequence of moraine formation are also discussed. None of the major phases has been dated absolutely and thus it is impossible to correlate the findings with other areas. However, it is clear that the events outlined in this paper occurred at the end of the last glaciation. One lasting contribution of this investigation should be the recognition of a major period of late-glacial and moraine construction along this section of the Newfoundland coast. Another is the realization that air photograph interpretation is extending the knowledge of the distribution of glacial forms along the mainland Newfoundland coast, showing that Tanner's original conclusions on late-glacial events were oversimplified (See SIP 3112). -- BLE

# CRRF BIBLIOGRAPHY

SIP 22814

551. 338.551.79(\*423)

Tomlinson, R. F.  
PLEISTOCENE EVIDENCE RELATED TO GLACIAL  
THEORY IN NORTHEASTERN LABRADOR. Can.  
Geographer, 7(2):83-90 incl. illus., maps, 1963.  
25 refs.

DLC, G1.C28

Field investigations were made during the 1958 summer of maximum glaciation in the Kaumajet Mountains area. The evidence (mainly the distribution of erratic boulders) is discussed in relation to Loken's conclusions and Dahl's theory concerning the marginal slope of ice sheets in Northeastern Labrador. The concept of ice spreading over the continental shelf receives support from the geological evidence. Till and submerged and terminal moraines have been found. The Pleistocene sea level is directly related to the question of shelf ice. The exact position of the glacial shoreline is nowhere known, although the interaction of many complex factors, including a glacio-eustatic fall of ocean level, isostasy, epeirogenic uplift, and tectonic movements resulted in a negative change in base level during the glacial maximum. The surface gradient of the ice mass is a three-dimensional problem and only a plot of identified trimline heights on a three-dimensional basis will result in an understanding of regional ice slopes in this area. It is concluded that the clear evidence of glacial features found suggests inundation of these mountain blocks by the Labradorean continental ice mass and that this evidence must be considered in theories on continental ice slopes and glacial events in northeastern Labrador. -- BLE

SIP 22815

551. 324(\*49)

Heusser, Calvin J. and Melvin G. Marcus  
GLACIOLOGICAL AND RELATED STUDIES OF  
LEMON CREEK GLACIER, ALASKA. Final Rept.,  
Juneau Ice Field Res. Proj., Amer. Geographical  
Soc., 38p. incl. illus., tables, graphs, diagr.,  
maps, 1960. 47 refs.

DLC, Tech. Rept. Collection

This paper summarizes and interprets the data collected on the Lemon Creek Glacier between 1953 and 1958 with emphasis on the 1958 season. Its purposes are to (1) explain the 1953-58 annual hydrological budgets and the glacier's variations during the 1900's on the basis of meteorological records, (2) consider the climatic changes between 1900 and mostly after the mid-1700 glacier maximum but also during post-glacial time, and (3) test further, using the additional 1958 movement and hydrological data, Nielsen's equations for the equilibrium glacier. The discussion includes the location and physical description of the glacier, the regional environment, the hydrological budget, surface movement and mass transfer of ice, budget-meteorological relationships during 1953-1958, following the mid-eighteenth century, and during the millennia since the ice age. -- BLE

SIP 22816

551. 333(\*701)

Long, William E.  
USNC-IGY ANTARCTIC GLACIOLOGICAL DATA  
FIELD WORK 1958-59. PRELIMINARY REPORT OF  
THE GEOLOGY OF THE CENTRAL RANGE OF THE  
HORLICK MOUNTAINS, ANTARCTICA. Rept. No.  
2, Pt. VIII. Proj. 825, Ohio State Univ. Res. Foundation, 23p. incl. illus., diagr., map, Sept. 1959.  
DLC, Tech. Rept. Collection

Information is presented concerning the geography, stratigraphy, geologic structure, and geologic history of the central group of the Horlick Mountains, which extends from 130°W to 85°W, roughly following the 85th parallel. The rocks collected apparently represent a continuous, nearly undisturbed Beacon series and descriptions of fossiliferous and provably marine Lower Paleozoic rocks from Antarctica. Apparently the only other marine fossiliferous Paleozoic rocks described have been erratics which contained Cambrian and Devonian fossils. Rocks which resemble the graywacke of the Horlick Mountains have been noted in other parts of Antarctica and it has been suggested that some of these may be Paleozoic rocks, but these rocks have been unfossiliferous. -- BLE

SIP 22817

551. 33(\*764)

Péwé, Troy L.  
USNC-IGY ANTARCTIC GLACIOLOGICAL DATA  
FIELD WORK 1958 AND 1959. MULTIPLE GLACIATION IN THE MCMURDO SOUND REGION, ANTARCTICA. A PROGRESS REPORT. Rept. No. 2, Part IX, Proj. 825, Ohio State Univ. Res. Foundation, 27p. incl. illus., table, graph, maps, Feb. 1960. 19 refs.  
DLC, Tech. Rept. Collection

At least four major Quaternary glaciations, each successively less extensive than the former, are recorded in the McMurdo Sound region of Antarctica. Deposits of the earliest recognized glacial advance occur high on ridges and flat areas. The deposits are 2000 ft above the valley floor, are badly weathered, and have little or no morainal form. Ice of this glaciation filled all the valleys and must have filled McMurdo Sound to an elevation of 2000 ft. Deposits of the next two succeeding glaciations are distributed around the Sound as well preserved but considerably subdued moraines of both outlet and alpine glaciers. During the earlier of these two glaciations, alpine glaciers reached the expanded Koettlitz and Ferrar outlet glaciers. Outlet glaciers filled the southern part of McMurdo Sound to an elevation of about 1000 ft. During the latter of these two advances many alpine glaciers did not reach the outlet glaciers. The latest major glaciation is represented by well preserved ice-cored moraines. Number and position of deltas in drained glacier-ice-blocked lakes suggest 3 stillstands or minor advances during this glaciation. Radiocarbon dating of algae in drained ponds indicates a minimum age of 6000 yr for this glaciation. (Author's abstract)

# CRREL BIBLIOGRAPHY

SIP 22818

551. 589:551. 524. 32:681. 14

Jorgensen, Donald L.  
A COMPUTER DERIVED SYNOPTIC CLIMATOLOGY  
OF PRECIPITATION FROM WINTER STORMS. J.  
Applied Meteorology. 2(2):226-234 incl. illus.,  
tables, graphs, diagrs., maps. 1963. 1 ref.  
DLC, QC851. A66

As part of the problem of forecasting heavy snowstorms in the eastern and central U. S., a synoptic climatology of the precipitation associated with winter storms has been derived. The basic data consisted of 150 synoptic situations obtained from 29 storms which satisfied the specified criteria as to location, temperature and intensity. An observing network of 400 stations was used to obtain 6-hr precipitation amounts used in the study. To obtain the derivation, a procedure was developed which could be programmed for an electronic computer by utilizing storm center position (or some other storm feature) and observations of a weather element over a sufficiently dense network of reporting stations. The print-out of the areal distribution of the weather element over the grid network results in a synoptic climatology of winter time precipitation. -- CLC

SIP 22819

551. 322:548. 51:551. 576

Eadie, William J. and Thomas R. Mee  
THE EFFECT OF DRY-ICE PELLET VELOCITY ON  
THE GENERATION OF ICE CRYSTALS. J. Applied  
Meteorology. 2(2):260-265 incl. illus., tables,  
graphs. April 1963. 12 refs.  
DLC, QC851. A66

The influence of fall velocities of dry-ice pellets on the nucleation of slightly supercooled clouds is discussed and the conditions necessary for the production of ice crystals are examined. A theoretical argument is presented which suggests that when cloud temperatures are warmer than about -5°C, the number of ice crystals produced by a pellet of dry ice moving at its terminal velocity decreases rapidly as the temperature approaches 0°C. In contrast to the pellet moving at terminal velocity, it is shown that the ice crystal productivity of a slowly moving pellet remain high up to 0°C. These findings indicate that a "stationary" seeding technique, where the embryonic ice crystals remain in a low temperature, highly supersaturated environment for at least 10 to 20 milliseconds, may permit modification of supercooled clouds and fogs in the -5°C to 0°C where previous attempts have not been effective. An experimental verification of this predicted dependence upon pellet velocity is described and the implications of these findings for future seeding experiments are discussed. (Authors' abstract, modified)

SIP 22820

551. 578. 7:621. 396. 96(74)

Geotis, Spiros G.  
SOME RADAR MEASUREMENTS OF HAILSTORMS  
J. Applied Meteorology. 2(2):270-275 incl. illus.,  
tables, graphs, diagrs., April 1963. 7 refs.  
DLC, QC851. A66

The radar reflectivity of thunderstorms at 10 cm with the proper instrumentation can detect hail and provide an estimate of its size. The physical characteristics of the hailstorms, as deduced from 3- and 10-cm echoes of a large number of New England hailstorms of 1961, are described. If the reflectivity of thunderstorms in New England exceeds the empirical hail criterion of  $Z_e = 10^{2.5}$  continuously for several minutes, the occurrence of hail at ground is virtually certain. Further, the greater the reflectivity, the larger the hail. The hail echo, or zone of maximum reflectivity, at both 3 and 10 cm is usually contained within the lowest 20,000 ft of the thunderstorm. The hailstorm possesses no great singularity beyond that of its significantly high reflectivity. It is concluded that the larger hailstones contribute little to the total liquid water content of the thunderstorm as the highest reflectivities measured are easily accounted for by low concentrations of large hail, wet or dry. (Author's abstract, modified)

SIP 22821

629. 113:556. 1:624. 148. 7(+50)

Bakurevich, Iu. L., and S. S. Tolkachev  
OPERATION OF MOTOR VEHICLES DURING WINTER.  
(Ekspluatatsiia avtomobilei zimoi; text in Russian).  
Moscow, Izd-vo Transport, 1964, 239p. incl. illus.,  
tables, map, diagrs., graphs. 70 refs.  
DLC, Slavic unclassified

Metal and rubber parts, cooling fluids and lubricants, fuel and electrolyte, and starting and running of the engine are all affected by severe climatic conditions. Advice is given to prepare motor vehicles for freezing weather and for winter maintenance. Recommended practice includes heating and warming devices in the automotive auxiliary equipment. Methods and formulas for computing the load carrying capacity of winter highways and crossings built on river and lake ice are presented. Methods of installation and operation of open parking places and uses of mobile equipment for the rescue work and emergency repairs are described. Type and construction requirements of motor vehicles and other means of transportation specially built for cold regions of the Soviet Union are reviewed. -- VDP



COREL BIBLIOGRAPHY

SIP 22822

551. 341:624. 139. 22 : 3

Williams, P. J.

QUANTITATIVE INVESTIGATIONS OF SOIL MOVEMENT IN FROZEN GROUND PHENOMENA.

Biuletyn Peryglacjalny (Lódź), No. 11:353-362 incl. illus., table, graph, diagrs., Oct. 1964. 24 refs. [Also: Res. Paper No. 227, Div. Building Res., Natl. Res. Council (Can.), Oct. 1964].

DLC. QE1. B55

Frost heave is the most widespread and fundamental form of movement in which expansive and contractive movements occur perpendicular to the ground surface as a result of freezing and thawing. There are many types of lateral or downslope movement. Repeated tape measurements of the position of wooden stakes showed localized movements of 10 cm/yr in a vegetation covered slope. In so-called rock glaciers (large boulder accumulations which have a "tongue" or "flow"-like form), occasional movements of 100 to 300 cm/yr have been recorded, although only a few cm/yr is common. The many forms of patterned ground are the results of various movements and sorting processes and the term is usually restricted to features occurring on level ground. An increase in width of 0.5 to 1 cm/yr has been observed in ice wedges. The maximum measured rate of movement of marked stones in small-stone polygons is 10 cm/yr. A comparison of photographs of stony-earth circles taken annually showed small-stone movement of 1 to 2 cm/yr. The circles take 10 or more years to form. No changes could be perceived in successive photographs of frost hummocks over a 6-yr period. A detailed description is given of an apparatus (a plastic tube and probe) in which it is assumed that tube deformation corresponds to the movement of adjacent soil and hence determines subsurface movements. -- BLE

plastic bottomless prism which has a small outlet at the top for pumping. The two prisms are then placed on the spectrometer table and a small quantity of vaseline, applied to the bottom edges of the outer prism, ensures a vacuum tight seal. Water can be frozen by pumping in about 40 min and can be kept frozen by continuing to pump. The angle of the prism can be measured either before or after the measurement of the angle of minimum deviation. In case a vacuum pump is not available, it is possible to freeze the water by surrounding the hollow prism with dry ice. In this case, however, condensation on the prism faces forces one to work quickly. This technique has several advantages over the ice-lense method described by Horton (SIP 22312). The results are within 2% of the Pullrich figure of 1.31. -- BLE

SIP 22824

551. 345. 1:536:551 481. 1(\*440)

Johnston, G. H. and R. J. E. Brown

SOME OBSERVATIONS ON PERMAFROST DISTRIBUTION AT A LAKE IN THE MACKENZIE DELTA.

N. W. T., CANADA. Res. Paper No. 233, Div. Building Res., Natl. Res. Council, Can., NRC 8252, 13p. incl. illus., graphs, maps, Nov. 1964. 11 refs. (Also in: Arctic, 17(3):162-175, Sept. 1964).

DLC. Tech. Rept. Collection

Moving or standing bodies of water that accumulate an excess of thermal energy inhibit the formation of permafrost and cause thawing of the underlying frozen ground. In permafrost areas, a thawed zone is always found under lakes and streams that have a mean bottom temperature greater than 32°F. The effect of rivers on thawing of permafrost is more difficult to assess because flowing water complicates the energy exchange relationships. The influence at the edge of a large body of water such as an ocean or a very large lake depends upon the magnitude of the temperature difference between the land surface and the bottom of the water body, the thermal properties of the ground materials, and past changes in climate or shoreline configuration or both. The extent of the thawed zone found under lakes and streams with a mean bottom temperature greater than 32°F depends on factors which include the thermal characteristics of the water body and the adjacent ground, the size and depth of the water body, general hydrologic conditions, thickness of ice and snow cover, and the composition and history of accumulation of bottom sediments. This investigation consisted primarily of drilling and sampling whereby holes were bored to various depths at 4 locations. Terrain observations and a soil profile were made. The thawing effect of the lake is confined to the ground lying under the lake but the thermal effect of the lake extends some distance beyond its perimeter. -- BLE

SIP 22823

551. 332:535. 32

Sandhu, H. S. and G. B. Friedmann

REFRACTIVE INDEX OF ICE. Amer. J. Phys. 33 (1):62, Jan. 1965. 1 ref.

DLC. QC1. A47

A technique has been developed of determining the refractive index of ice using a prism set at minimum deviation on a spectrometer. Water is solidified by pumping off vapor with a rotary pump. In order to freeze the water, an equilateral hollow prism is placed inside another slightly larger 1/8-in. acrylic

# CRREL BIBLIOGRAPHY

SIP 22825

551. 345-536. 62 . 65

Williams, P. J.  
EXPERIMENTAL DETERMINATION OF APPARENT  
SPECIFIC HEATS OF FROZEN SOILS. Res. Paper  
No. 226, Div. Building Res., Natl. Res. Council,  
Can., NRC 8031. 9p. incl. table, graphs, diagr.,  
Oct. 1964. 8 refs. (Also in: *Geotechnique* 14(2):  
133-142, June 1964).  
DLC, Tech. Rept. Collection

This paper describes determinations made with a calorimeter of the specific heats and apparent specific heats of various soils for temperatures above 0°C and down to -10°C. Water in porous material freezes below 0°C and as ice is formed the freezing point of the decreasing quantity of unfrozen water falls further below 0°C. Latent heat of fusion is thus involved in temperature changes over a range extending to several degrees below 0°C. The latent heat and specific heat constitute an apparent specific heat. Apparent specific heats are dependent on soil type and are generally larger for finer-grained soils. For a given soil, apparent specific heats are dependent on (1) temperature, being larger at temperatures nearer 0°C, (2) whether the soil is freezing or thawing and, in the latter case, the lowest temperature reached during freezing, and (3) in compressible soils, whether the soil has been previously frozen and thawed or dried and rewetted, and to what extent. Differences in total moisture content have little effect on the apparent specific heats for temperatures below -0.5°C. -- BLE

SIP 22826

551. 33(\*41)

Zoltai, S. C.  
GLACIAL FEATURES OF THE CANADIAN LAKE-  
HEAD AREA. *Can. Geographer*, 7(3):101-115 incl.  
tables, maps, 1963. 36 refs.  
DLC, G1. C28

During the summer of 1961 field studies were carried out in the western portion of the Canadian Lakehead area. It lies between 89°10' and 90°00'W, and is bounded by the International Boundary in the south and 48°50'N in the north. The total land area is about 2000 mi<sup>2</sup>. All glacial advances are considered to be late Wisconsin events. The first discernible ice movement came from the north-northeast, spreading beyond the study area. As melting increased and land became free of ice, a small marginal lake was created (Lake Omimi) in front of the ice in the extreme southwestern portion of the area in which brown varved clays were deposited. Glacial striae, drumlins, and eskers indicate three distinct directions of ice movement: south, southwest, and fanning westward. Glacial features studied included ground moraines, drumlins, terminal moraines, and glaciofluvial, glaciolacustrine, and recent deposits. The interpretation of the observations is based primarily on studies of spillways, and glacial lakes. The glacial chronology of the area is summarized. -- CLC BLE

SIP 22827

551. 33(74)

Nelson, J. G.  
PRE-ILLINOIAN GLACIATION IN CENTRAL  
PENNSYLVANIA. *Can. Geographer*, 7(3):145-147  
incl. illus., maps, 1963. 2 refs.  
DLC, G1. C28

Evidence is presented to show that at least parts of Leverett's pre-Illinoian glaciated area were covered by ice. During the summers of 1959-60 two sites located in Leverett's pre-Illinoian glaciated area were examined and found to contain distinctive erratics. These erratics and the position and structural character of the deposits containing them constitute the evidence of glaciation. The deposits at the Charlton and Milton sites were transported directly by ice. Sandstones unlike any in the general vicinity were found in quarries located at the Charlton and Milton sites. The closest outcrops of similar rocks are located approximately 1 to 10 mi away, and many have been truncated by ice. These deposits strongly support Leverett's original ideas on Pennsylvania glaciation and show that at least part of his pre-Illinoian area was glaciated. -- CLC

SIP 22828

551. 321. 2:622 233:551. 312. 2(\*430)

Hughes, Owen L. and J. Terasmae  
SIPPE ICE-CORER FOR OBTAINING SAMPLES  
FROM PERMANENTLY FROZEN BOGS. *Arctic*,  
J. Arctic Inst. N. Amer. 16(4):270-272 incl. illus.,  
Dec. 1963.  
DLC, G600. A695

During the 1962 field season, a hand-operated SIPPE ice-corer was used by the Geological Survey of Canada in northern Yukon Territory to obtain continuous cores through a variety of materials (moss peat, sedge peat, guttja, and woody peat) to depths down to 94 m. Much of the material contained minor amounts of silt and sand with occasional pebbles, and one hole was drilled 4 m. into stony clay below the bog. Although excellent cores were obtained, two deficiencies were found in the ice-corer as used: (1) mineral matter in the deposits dulled the cutting teeth so that after drilling about 20 ft they had to be sharpened or replaced; and (2) it took too long (3 hr or more) to drill holes 7 to 8 ft deep. Remedies are suggested. The two power units (a McCulloch chainsaw motor and a Haynes Earth Drill) used to test the power-driven SIPPE ice-corer both proved adequate for coring frozen woody peat at the rate of 20 to 30 sec 18-in. length of core. Details are given of the power units tested. -- BLE

# CRRCL BIBLIOGRAPHY

SIP 22829

551. 33:551. 436 1(\*423)

Morrison, A.  
LANDFORM STUDIES IN THE MIDDLE HAMILTON  
RIVER AREA, LABRADOR, Arctic; J. Arctic Inst  
N. Amer. 16(4): 272-275, Dec. 1963. 1 ref.  
DLC. G600 A695

Investigations were made during the summers of 1961 and 1962 to determine the sequence of events that led to the development of the system of canyons occupied by the middle part of the Hamilton River and many of its tributaries. Ground checking of airphoto interpretation of landforms and surface geology, and general investigation on the ground was the basic technique used. Soil samples were collected primarily for particle-size analysis. Striations and associated marks on bedrock indicating the direction of ice movement were found only occasionally. Also discussed are till-fabric analysis, pollen analysis, radiocarbon dating, and patterned ground. It is provisionally concluded that (1) the landforms of the area were shaped by two ice movements, one from the southwest and later one from the northwest; (2) the greater part of the canyons existed before the ice disappeared; and (3) wherever there is a local relief of more than 100 ft. the minor landforms can usually be resolved into a sequence of erosional or depositional forms or both, produced while the level of the ice surface and the water table within the ice were falling and the ratio of water to ice was increasing. -- BLE

SIP 22830

551. 322:548. 51:547

Garten, V. A. and R. B. Head  
A THEORETICAL BASIS OF ICE NUCLEATION BY  
ORGANIC CRYSTALS. Nature, 205(4967): 150-162  
incl. table, graph, diagr., Jan. 9, 1965. 16 refs.  
DLC. Q1 N2

This article is concerned primarily with the possibility of predicting the nucleative activity of organic crystals, and its laboratory assessment. No relation exists between the onset temperature (which depends on the method of preparation and the particle-size range) and  $N$ , the number of nuclei/gm. active over an extended temperature range. Although large particles nucleate with less supercooling than small ones,  $N$  depends essentially on the number of small particles. If the temperature is lowered 2°C min until the rate of nucleation is 1 nucleus/sec  $10^3$ - $10^4$  part/cles, the following results are obtained: (1) phloroglucinol dihydrate, -4.5°C; (2)  $\alpha$ -phenazine, -3.5°C; (3) metaldehyde, -5° to -6°C; (4) AgI, -4°C. To obtain reproducible results in a cloud chamber from aerosols prepared by sublimation, low concentration of vapor (e.g., 100  $\mu$ gm/l) at constant temperature should be swept at standard speeds through a standard orifice by preheated gas into a large reservoir from which equal parts may be taken. It is now agreed that efficient ice nucleators need not belong to the same crystal system as ice, but it seems unlikely that ice nucleators can be predicted

solely from considerations of molecular structure. The present concept of fit is based on the coincidence of hydrogen-bonding groups (HBGs) at the interface between the ice and the organic crystal. When no registry exists between a nucleator and ice, nucleative power is independent of the presence or absence of a resultant dipole moment. The selection of practically useful cloud-seeding agents must consider the toxicity and stability of the compounds that have been proven efficient. -- BLE

SIP 22831

551. 324(235. 24)

Kick, W.  
CHOGO-LUNGMA GLACIER, KARAKORAM, II.  
(Der Chogo-Lungma-Gletscher im Karakorum, Text in German with English summary). Z. Gletscherkunde u. Glazialgeologie, 3(1): 1-59 incl. illus., tables, graphs, maps, April 1964. 64 refs.  
DLC. QE575. A43

This paper presents an interpretation of the glaciological observations made in the Chogo-Lungma (CL) region in Oct. 1954 (See SIP 14972 for Part I). Emphasis is placed on 3 maps which were prepared of the region, the morphological types of valley glaciers in High Asia which includes a summary of the conceptions and formulations since 1856, the morphological types of glaciers in the CL basin, the climatic snow limit, the dimensions and longitudinal and movement profiles of the glacier, the ice depth and surface velocity of valley glaciers, and glacier variation in the CL basin since 1835. -- BLE

SIP 22832

551. 578. 46:531. 754.551. 578. 41

Power, B. A., P. W. Summers and J. D'Avignon  
SNOW CRYSTAL FORMS AND RIMING EFFECTS AS  
RELATED TO SNOWFALL DENSITY AND GENERAL  
STORM CONDITIONS. J. Atmospheric Sciences, 21  
(3): 300-305 incl. illus., tables, graphs, diagrs.,  
May 1964. 18 refs.  
DLC. QC851. A283

A good relationship has been found at Montreal between the density of newly fallen snow and the form of the predominant crystal which makes up the snowfall. A marked influence of riming in increasing the snowfall density is found. A dependence of the degree of riming upon snow crystal form is also indicated. Evidence is presented that in some cases the snow-growth levels were associated with high relative humidity at the base of a frontal inversion. A continuous automatic snow crystal recorder is described which uses the Formvar replica principle (Authors' abstract)

# CRREL BIBLIOGRAPHY

SIP 22833

551. 578. 46:538:654. 16

Yokota, K.  
STUDY ON THE REFLECTION OF ELECTROMAGNETIC WAVES FROM INHOMOGENEOUS MEDIA, ESPECIALLY THE EFFECT OF SNOW COVER ON ULTRA-HIGH FREQUENCIES. (Fukinshitsu baishitsu ni yoru denjina no hansha ni kansuru kenkyū, tokuni chokoshūhatai ni taisuru sekisetsusō no eikyō ni tsuite no ginmi; Text in Japanese). Yamagata daigaku kiyō, kōgaku (Bull. of Yamagata Univ., Dept. of Engineering), 7(2):163-210 incl. tables, graphs, diagrs., Feb. 1963. 22 refs.  
DLC, Orientalia Div.

The reflection of electromagnetic waves from snow cover is investigated in order to determine the effect on radio-wave communications using ultrahigh frequencies. A theoretical analysis was made of the reflection of a plane wave from a parallel stratified medium consisting of an inhomogeneous and a homogeneous layer. Electromagnetic properties of snow and ground such as permittivity, loss tangent, and attenuation were studied based on experimental data. The changing behavior of snow permittivity as a function of depth was examined using Cumming's relation, and 5 snow-cover models were constructed. The theoretical reflection coefficients are found to be in good agreement with experimental results. --  
CST, BLE

SIP 22834

721. 011(\*50:211)

Litskevich, V. and others  
HOUSING IN A SEVERE CLIMATE. (Zhilishcha dlia raionov s surovym klimatom; Text in Russian). Arkhitektura SSSR, No. 1:10-16 incl. illus., diagrs., 1959. 3 refs. (Eng. transl.: Natl. Res. Council (Can.), Tech. Transl. No. 1154, Nov. 1964).  
DLC, NA6. A74

Five papers discuss the problems of designing new types of dwellings in northern areas of the USSR where weather conditions are similar to those in the northern regions of Canada. Factors considered include the effects of permafrost, wind, low temperatures, drifting snow, and hours of daylight. Existing designs are appraised and their limitations are discussed in terms of room layout, window arrangement, and their general adaptability to local climatic conditions. Particular emphasis is placed on the effects of wind in winter on the thermal efficiency of housing and of snow accumulations around buildings. Methods of modifying these effects by proper design and orientation are analyzed. The papers are entitled: (1) Plans of housing units for the Far East, by V. Litskevich, (2) The special characteristics of planning and construction in the Far North, by I. Vonog, (3) Methods of construction for protection against the wind, by I. Romm, (4) On a housing standard for the Arctic, by S. Kozhurin, and (5) The need for satisfactory sets of standard housing and design for regions with a severe climate, by A. Bryzhkin. --  
BLE

SIP 22835

551. 508. 77:551. 578. 45: (\*746)

Rusin, N. P.  
SNOW BLOWING INTO PRECIPITATION GAGES DURING LOW SNOW STORMS. (Naduvanie snega v osadkomer pri nizovykh metel'akh; Text in Russian). Leningrad. Glav. Geofiz. Observ., Trudy, Vyp. 129:118-121 incl. tables, graph, 1962. 3 refs.  
DLC, QC801. L46

The quantitative evaluation of snow blowing into a precipitation gage during low-level blizzards is outlined for Mirnyy (1956-58) and Pionerskaya (1958) Stations. A graph of wind speed against gage accumulation shows a nearly-straight line for each station. For a given wind speed, e. g., 15 m/sec, there is more accumulation in 12 hr at Pionerskaya (2.7 mm) than at Mirnyy (1.5 mm). With the gage positioned at 10 m above the surface, accumulation for 12 hr ranges from 0.3 to 5.0 mm for wind speeds of 9 to 23 m/sec. -- JFS

SIP 22836

551. 33:551. 7:551. 345: (\*531. 7)

Zhestkova, T. N., G. M. Fel'dman, I. E. Dukhin and P. F. Shvetsov  
THE FORMATION OF GLACIAL HORIZONS IN EPIGENETIC FROZEN STRATA. (K voprosu formirovaniia l'distykh gorizontov v epigeneticheskikh merzlykh tolshchakh; Text in Russian). Doklady Akad. Nauk SSSR, 156(3):558-560 incl. graph, 1964. 6 refs.  
DLC, Slavic Div.

Theory and observations on moisture migration in capillary action are described for marine deposits (gray loam) obviously frozen after the strata formation in the Bol'shezemel'skaya Tundra (Arkhangel'sk region, 67°N and 56°E). In the lithologically homogeneous stratum (100-120 m thick) observed, three distinct glacial horizons at a depth of 15-20, 40-45 and 70-75 m were found. Below the frozen stratum an increase of the rock temperature was observed. The occurrence of the horizons is not connected with any modification in the rock composition and is apparently created by moisture moving towards the frost layer, the intensity of the migration depending on secular and millennial temperature variations at the surface, a rising temperature causing the boundary to come to a virtual standstill at a certain level for long periods. Formulas are proposed for the thermal-moisture field, the capillary flow and the periodic accumulation of ice in rock strata. -- VDP

# CIREL BIBLIOGRAPHY

SIP 22837

551. 574. 4:621. 315. 175(\*50)

Rudneva, A. V.  
WET SNOW AND CABLE ICING IN THE USSR  
(Mokryi sneg i obledenenie provodov na territorii  
SSSR; Text in Russian). Leningrad, Gidromete-  
orologicheskoe Izd-vo, 1964. 165p. incl. illus.,  
tables, graphs, diagrs., maps. 25 refs.  
DLC, Slavic Div.

In the European territory of the USSR wet snowfalls occur more often in north-western areas, and in regions situated to the north of 65° latitude (30 to 40 days annually). Snowfall is observed less often elsewhere, especially in southern and south-eastern regions (about 5 days annually). In the Asiatic area there are 10 to 20 days of wet snow annually. The greatest recurrence takes place in some regions of Kamchatka (30 to 40 days annually). On the basis of visual observations made at approximately 2000 meteorological stations (tabulated with elevation and time of observation) during 1940 to 1960, the number of wet-snow days has been computed, tabulated and graphed for various regions of the USSR. A map of the equal annual wet-snowfall days was compiled on a scale of 7,500,000. Using observations made at 1000 meteorological stations from 1947 to 1960 a map of the maximum deposits of wet snow on wires 2 m above the ground, was compiled. The maximum amount varies between 15 mm and 40 mm and can reach 100 mm (in some regions of the Far East and Kamchatka). In planning power line construction, precautionary measures to be taken include consideration of the anticipated amount of glaze, predominant ground features, and the type of icing that may occur. -- VDP

SIP 22838

551. 322:539. 32

Bogorodskii, V. V.  
ELASTIC MODULI OF ICE CRYSTALS. Soviet  
Physics-Acoustics, 10(2):124-126 incl. illus.,  
tables, diagr., Crt. Dec. 1964. 7 refs.  
DLC, QC221. S6

Elastic moduli, calculated from the velocities of longitudinal and shear waves as measured at 4 Mc at 0°, -10° and -15°C, are reported for natural ice crystals. Pieces of ice 100 x 100 x 60 cm were extracted from the ice on Lake Paduga. The surface on the water side was dusted with red lead and exposed to the sun. After 2-3 hr the red lead had penetrated into the bands between the crystals. Crystals of mean size 25-30 cm were extracted. Then a small part of a large crystal was exposed briefly to the radiation from a powerful electric pump, which caused extensive separation along the cleavage planes in the irradiated part which was later discarded. A cautery was used to cut parallelepipeds and cubes of sides from 3 to 15 cm. Numerical calculations show that the deviations from purely transverse or longitudinal motion are small, so the actual waves can be treated as quasi-longitudinal and quasi-transverse. A system of equations is given with which the speeds

of waves in hexagonal crystals can be determined. These measurements show that the anisotropy of ice crystals is small, being nearly the same as that of magnesium. -- CLC

SIP 22839

551. 332. 51(\*38)

Weidick, Anker  
ICE MARGIN FEATURES IN THE JULIANEHAB  
DISTRICT, SOUTH GREENLAND. Medd. Grønland,  
165(3):12p. incl. illus., tables, graphs, maps,  
1963. 75 refs.  
DLC, Q115. D39

This report concerns the extension of the ice margin deposits in the Julianehab District, South Greenland. A Holocene chronology is established for the ice margin deposits within the region on the basis of their association with raised marine shore lines, combined with a determination of fluctuations of the glaciation limits of the individual stages in Holocene times. Emphasis is placed on the Narssarssuaq region in the northeastern part of the district, which contains numerous extensive ice deposits. After the deglaciation of the district during the last phases of the Wisconsin, 4 periods of stagnation or readvance of the glacier lobes and ice caps (4 "stages") gave rise to the formation of ice deposits. The earliest of these stages is the Niaqornakasiik stage (older Dryas?), succeeded by the Tunugdliarfik stage (probably younger Dryas), the Narssarssuaq stage (probably Roman time), and the maximum extension of the ice in historic times (ca. 1750-1900 A.D.). The volume variation is discussed of the ice cover (the inland ice and the Julianehab ice cap) during the period from the Tunugdliarfik stage to the present. The superficial conditions of the ice cover above 1700 m has not altered much since the Tunugdliarfik stage. Deposits from former ice-dammed lakes in the Narssarssuaq region indicate that the lakes at the glacier front had a maximum water-level height of 120-150 m. This is in accordance with J. W. Glen's theory of subglacial outbursts of ice-dammed lakes. (Author's abstract, modified)

SIP 22840

551. 324. 63(\*49)

Marcus, Melvin G.  
CLIMATE-GLACIER STUDIES IN THE JUNEAU ICE  
FIELD REGION, ALASKA. Res. Paper No. 88,  
Dept. of Geography, University of Chicago, 128p.  
incl. illus., tables, graphs, diagrs., maps,  
appendixes A-C, 1964. 109 refs.  
DLC, H31. C514, no. 88

This study evaluates glacier fluctuations in terms of meteorological parameters such as temperature and precipitation. The relationships discussed have been derived only for temperate glaciers. The investigations were focused on Lemon Creek Glacier. Emphasis is placed on regional and local environments,

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hydrological budget studies, climatological and meteorological factors in the Juneau area and their relationship to adjacent ice-field zones, climatic influences on the hydrological budget, and climatological and glaciological trends in the Juneau Ice Field region. The appendixes are entitled: History and index of meteorological stations on or near the Juneau Ice Field; Summary of mean monthly temperature changes between Juneau Airport and selected free air levels above Juneau Airport, and their variance: 1946-53; and Monthly mean temperature differences and their standard deviations between the surface and selected levels above Juneau Airport: 1946-53. -- BLE

SIP 22841

551. 321. 3:624. 144. 55

Gifford, S. E.  
ICE GRADING EQUIPMENT - DEVELOPMENT OF AN EXPERIMENTAL ROTATING-DRUM CUTTER. Tech. Rept. R-346, Naval Civil Eng. Lab., 19p. incl. illus., table, graph, diagrs., Nov. 11, 1964. 3 refs.  
DLC, Tech. Rept. Collection

Tests of an experimental rotating-drum ice cutter are described. The tests were performed to determine the feasibility of grading polar ice surfaces by removing excess ice by fracture, using impact cutters mounted on a rotating-drum. The experiments were conducted to learn the best shape, size, and number of cutters required, the amount of horsepower needed for various depths of cut and travel speeds, the relative merits of overcutting and undercutting, and the most suitable cutting-drum rotating speed. The ice cutter's performance, which was tested in a cold chamber, in Alaska, and in Greenland, revealed that removal of ice by fracture is feasible. The criteria obtained from these tests have been used to develop an ice dozer for pioneering in rough ice areas. This unit is currently being tested and evaluated at various field sites. (Author's abstract)

SIP 22842

624. 147:551. 463:621. 67(798)

Sherwood, G. E. and E. H. Moser, Jr.  
ICE CONSTRUCTION - MOBILE PUMP WANIGAN FOR CONFINED FLOODING. Tech. Rept. R-339, Naval Civil Eng. Lab., 25p. incl. illus., tables, diagrs., appendix, Oct. 12, 1964. 7 refs. (Task Y-F015-11-01-073)  
DLC, Tech. Rept. Collection

Advancements in flooding techniques for leveling and thickening natural ice areas for improved Arctic Ocean operations resulted in the development of a mobile pump wanigan for confined flooding. An extra-wide NCEL camp wanigan was outfitted for confining and distributing the flood water, for drying and storing the flooding gear, and to provide a warm

shelter for the construction personnel and sufficient illumination within 300 ft for ice construction at night. An experimental pump wanigan was evaluated at Point Barrow, Alaska, between 1958 and 1960, and selected components for the unit were evaluated at other field sites between 1960 and 1964. The mobile pump wanigan is well suited for thickening sea ice by confined flooding and is recommended as standard equipment for this type of ice construction. Specifications, reduced scale drawings, and commercial items were published in Tech. Note N-608. Erection instructions are given in Technical Note N-587. (Authors' abstract)

SIP 22843

551. 579. 2:551. 579. 5(\*50)

Omufrienko, L. G.  
LOSSES OF SNOWMELT ON SLOPES. Soviet Hydrology: Selected Papers, No. 1:55-61 incl. illus., tables, graphs, 1964. 8 refs.  
DLC, Unbound periodical

Results are presented of the results of observations made in the spring of 1960 on specially equipped runoff plots of the Pridesnianskaya Runoff Station. Observations were also made of liquid precipitation, soil moisture, depth of freezing and thawing of the soil, water equivalent of the snow cover, and the velocities of runoff on the slopes. The effectiveness of the influence of slope on the runoff was investigated in close relation to the state of the underlying soil surface. It is concluded that the true relation of snow-melt runoff to slope is revealed only when the soil moisture is close to total water-holding capacity or when it is accompanied by a large depth of freezing of the soil. The soil water content increases with the length of the slope. The further the point lies from the drainage divide, the greater is the soil moisture content. With an increase in the length of slope, the runoff losses due to percolation increase and the snow-melt value decreases. These conclusions apply to the case of fixed moisture content on the plots at the beginning of runoff. With continuous inflow of water, the runoff picture will be much more complicated. -- BLE

SIP 22844

551. 578. 483(235. 21)

Krasnosel'skii, E. B.  
ON THE PROBLEM OF DETERMINING THE DEGREE OF AVALANCHE HAZARD IN THE HIGH-MOUNTAIN REGIONS OF CENTRAL TIEN-SHAN. Soviet Hydrology: Selected Papers, No. 1:80-85 incl. graph, tables, 1964. 3 refs.  
DLC, Unbound periodical

Experimental results are presented of observations made to determine the conditions of formation and fall of snow avalanches, and the diurnal variation of the cohesion forces in the snow. Emphasis is placed on the mechanism of the cohesion forces which sup-

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port snow deposited on a slope, formulas for computing the cohesion forces in snow, the equilibrium conditions of snow on a slope, and the times at which the collapse of snow is most probable. The concept of the coefficient of avalanche hazard ( $K_{ah}$ ) is introduced as a factor which determines the critical state of snow on a slope. The results include certain parameters with which the degree of avalanche hazard can be determined and forecast to the nearest day. Since the trend of  $K_{ah}$  is known from daily observations and the time of the most probable snow-slide is taken into account and determined with the consideration of microclimatic features, the snow can be artificially collapsed before it becomes hazardous. -- BLE

SIP 22845

551.34:551.78(7)

Brunnschweiler, Dieter  
THE PERIGLACIAL REALM IN NORTH AMERICA DURING THE WISCONSIN GLACIATION. *Biuletyn Peryglacjalny* (Łódź), No. 11:15-27 incl., illus., maps, 1962. 34 refs.  
DLC, QE1.B55

The existence of frost-debris and tundra zones adjacent to the ice sheet in North America during the Wisconsin advance has been doubted because of the negative results of most pollen records. This is surprising since, theoretically, climatic conditions must have been as conducive to permafrost formation as in more oceanic Europe where the wide distribution of periglacial phenomena is well known. On the basis of geomorphologic and pedologic analysis, however, the evidence for periglacial morphogenesis is convincing. On the Atlantic Coastal Plain, the Piedmont, and in the Appalachians, cryoturbation and solifluction is much more widespread than formerly believed (frost-debris mantles, soil involutions, ice-wedge casts, polygonal structures in hardpans, boulder streams, loess and inland dunes, and thaw lakes). In the Midwest and the Great Plains, frost-disturbed soils occur along and within the Wisconsin terminal moraines and are particularly frequent in the Driftless Area of Wisconsin. Unique and well-retained forms of patterned ground (silt mounds and tongues surrounded by stone circles and stripes, respectively) were found in the Pacific Northwest. They occupy several hundred square miles, mostly on Columbia Plateau basalt and defy any explanation other than intensive former permafrost action. The distribution of periglacial and related features (loess, snow line, and biota) is used to reconstruct the morpho-climatic zonation of southern North America in the last cold phase of the Pleistocene. (Author's abstract)

SIP 22846

551.343(\*50)

Kachurin, S. P.  
THERMOKARST WITHIN THE TERRITORY OF THE U.S.S.R. *Biuletyn Peryglacjalny* (Łódź), No. 11:49-55 incl. illus., graph, 1962. 19 refs.  
DLC, QE1.B55

Thermokarst is a widespread natural phenomenon found only in permafrost regions. Ground ice near the surface is necessary for the formation of thermokarst. The main cause of its origin lies in changes of the heat exchange conditions in the upper layers of deposits, leading to the melting of the ground ice. Alterations in the heat exchange within the layer of seasonal thermal fluctuations (i.e. in layers up to 15-20 m in depth) depend on many factors and not climatic changes alone. Thermokarst development is influenced by the geological structure, the facial differences of the deposits, and the geomorphic conditions prevailing in the area of occurrence. The similarity of thermokarst settling features causes difficulties in ascertaining the genesis of the forms as well as in their classification. Thus, in studying the thermokarst, it is necessary to apply various methods of field and laboratory investigations. Data obtained from the literature suggest that 3 main zones of thermokarst development may be distinguished in the USSR but no clear boundary can be drawn between these zones. The history of thermokarst development is closely related to the aggradation of permafrost during the Quaternary and the process of its degradation. The increasing influence of human activities upon the natural conditions of the environment is especially significant and promotes a further development of thermokarst. (Author's abstract, modified)

SIP 22847

551.345.3(\*49)

Péwé, Troy L.  
ICE WEDGES IN PERMAFROST, LOWER YUKON RIVER AREA NEAR GALENA, ALASKA. *Biuletyn Peryglacjalny* (Łódź), No. 11:65-76 incl. illus., graphs, diags., 1962. 11 refs.  
DLC, QE1.B55

Foliated ground-ice masses exposed in vertical banks of the Yukon River occur as wedges or vertical or inclined dikes 4 mm to 3 m wide and 1 m to 5 m high. Individual wedges are part of a polygonal network of ice-enclosing polygons or cells of frozen ground 1 m to 30 m in diam. The dominant foliation or lineation of bubbles and minute soil particles is subparallel to the sides of the ice masses. Some sharp-walled, clear, white ice-filled veins 1 to 5 mm wide run parallel to or cut across the prominent foliation. Many of the planes of foliation are faulted, sheared, bent, or otherwise deformed by minor movement and adjustments within the ice mass. The crystals are 1 to 100 mm in diam., colorless, and equidimensional. The tops of the wedges have ice nipples or projections 10 to 150 mm wide extending upward 50 to 300 mm into the overlying frozen sedi-

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ments. Extending upward 50 to 600 mm from these ice projections are ice-filled fissures 2 to 10 mm wide, some of which extend to the ground surface. The sediments adjacent to the wedges are pushed up, and in many places overturned. The upturning may affect the sediment 1/2 to 3 m on either side of the masses. Foliated ice masses cross-cut other ground ice and sediment layers. Ice-filled cracks extending from the surface downward into the ice wedge, the cross cutting of sediments and older ice masses by ice wedges, and the foliation, support Leffingwell's hypothesis (SIP 264) that ground-ice masses form in seasonally recurring thermal contraction cracks in permafrost. (Author's abstract)

Investigations were made during Jan. to March 1958 of the glacial ecology at the end of the Colonia Glacier and of the glacial morphology of the Rio Baker and Rio Colonia valleys in southern Chile. The first ascent was made of the Cerro Arenales (3437 m) which protrudes from the middle of the ice field and is the third highest peak of the region. The snow line on the Arenales Glacier is estimated at 1300 m and is underlaid by an extensive ice mass which melts throughout the summer. Some of the characteristic features of the Patagonian glaciers are described and meteorological and flood data are given. Periodical floods occur more frequently in low level ice fields where the summer temperature is comparatively high. --BLE

SIP 22848

551.34(\*50)

Popov, A. I.  
PERIGLACIAL PHENOMENA AND THE LAWS OF  
THEIR DISTRIBUTION IN THE U.S.S. R. *Biuletyn  
Peryglacjalny* (Łódź), No. 11:77-83, 1962.  
DLC, QE1.B55

The elucidation of the most important active factors of frost lithogenesis constitutes the base of the system proposed for genetic types of frost-caused periglacial formation. Three cryo-morphological genetic groups are distinguished: a macrostructural one, comprising forms predetermined by frost cracks; a microstructural group, comprising forms predetermined by desiccation fissures with subsequent alternate congelation and melting along and between the fissures; and an astructural group uniting forms not predetermined by the formation of fissures. Differences in processes of frost-caused morphogeny in 3 regions, unequal in exogenetic development, determine also the most characteristic differences in the general aspect of the periglacial landscape. Less important are climatically controlled provincial differences of the frost-caused morphology and the differences provoked by an unequal historical development of diverse regions. The following regions can be distinguished throughout the USSR: (a) regions of accumulation, syngenetic with the development of periglacial forms, (b) regions of relative stabilization in accumulation and discharge with epigenetic development of periglacial forms and (c) regions of prevalent denudation with epigenetic development or periglacial forms. These regions are distinguished for both the present-day stage and for that of the Pleistocene. (Author's abstract, modified)

SIP 22850

551.34(\*324+420)

Waters, Ronald S.  
ALTIPLANATION TERRACES AND SLOPE DEVELOPMENT IN VEST-SPITSBERGEN AND SOUTH-WEST ENGLAND. *Biuletyn Peryglacjalny* (Łódź), No. 11:89-101 incl. illus., diags., maps, 1962. 8 refs.  
DLC, QE1.B55

Conspicuous among periglacial modifications of recently de-glacierized dolerite terrain in Ekmanfjord, West Spitsbergen, are rock benches and terraces on moderately inclined slopes (7-25°) lying between 50 and 100 m above sea level. Field observations suggest that the benches are fashioned primarily by frost heaving, frost shattering, and the gravitative transfer of debris. Their continuing development is converting formerly ice-smoothed, convex-upward slopes into stepped, but overall rectilinear slopes which retain their steepness as they retreat. A similar origin is suggested for terrace hillslopes displaying features similar to altiplanation terraces which are very characteristic of the higher parts of southwest England. The recognition that these landforms are periglacial features not only supports the conclusion that many parts of southern England exhibit relict periglacial landscapes, it also suggests that in some cases cryogenic processes have created, rather than smoothed out, irregularities of slope. The mature or equilibrium slope of cryoplanation is indeed smooth and compounded of accordant elements the inclination of each of which represents the slope limit appropriate to the calibre of the debris that is moved across it. But the achievement of cryoplanation on certain moderately inclined initial slopes is effected via the production and development of altiplanation terraces or congelifraction benches, which are characteristic of those parts of southern England where the complete periglacial metamorphosis was never realized. (Author's abstract)

SIP 22849

551.324(238:82)

Tanaka, Kaoru  
PERIGLACIAL STUDY IN THE PATAGONIAN ANDES  
*Biuletyn Peryglacjalny* (Łódź), No. 11:85-88 incl. table, 1962. 1 ref.  
DLC, QE1.B55



# CRRLE BIBLIOGRAPHY

SIP 22851

551.343.2

Hövermann, Jürgen  
THE LOCATION AND REGULARITY OF THE PATTERNED-GROUND LIMIT. (Über Verlauf und Gesetzmäßigkeit der Strukturbodengrenze; Text in German). *Biuletyn Peryglacjalny (Łódź)*, No. 11:201-207 incl. graph, 1962. 18 refs.  
DLC, QE1.B55

New investigations made almost simultaneously in Europe, Africa, and South America have proven that the patterned-ground limit subsides on a large scale from ocean to continental climates, i.e., the opposite of what has been assumed on the basis of less thorough observations. An investigation of older and more recent observations shows that in general the old concept can no longer be supported. Only on a small scale, i.e., where the elevation is the deciding factor, does the patterned-ground limit extend equally to the snow and timber line. On a large scale the limit subsides progressively from the ocean shoreline inland. In like fashion, the increase in occurrence in the dry regions from the pole to the equator is interrupted. In both cases, the limit runs contrary to the timber and snow lines and is almost completely independent of the moderate temperatures and the yearly and daily temperature fluctuations. (Author's abstract)

SIP 22852

551.332.2(235.24)

Kar, N. R.  
INVESTIGATIONS ON A PIEDMONT DRIFT DEPOSIT IN THE FOOT-HILLS OF THE EASTERN HIMALAYAS AND ITS GLACIAL AND PERIGLACIAL SIGNIFICANCE. *Biuletyn Peryglacjalny (Łódź)*, No. 11:211-228 incl. diagrs., maps, 1962. 18 refs.  
DLC, QE1.B55

The results are presented of investigations extending 40 mi from east to west and 10 to 12 mi from the Sub-Himalayan zone (Siwaliks) in the north to the North Bengal Plains in the south. The drift beds overlie the northward dipping, partly denuded strata of Siwaliks (Eocene-Pleistocene), and attain a maximum vertical thickness of 400-500 ft at the outlet of the Himalayan river Jaldhaka, which originates in the glaciated tracts of southeastern Sikkim. The thickness of the deposits decreases toward the plain. The drift-bed surface is hummocky and shows a chain of hillocks of drumlinoid form arranged in an arcuate fashion. It appears to be of pseudomoraine or bouldery topography typical of gravel fans at the base of the high Himalayas. The drift beds owe their origin to a vigorous glaciofluvial filling aided solifluction etc. during the Pleistocene glaciation. They are cut by 3 systems of terraces corresponding to 3 glacial periods. The extensive pseudomorainic deposits in the foothills and at the river outlets belong to the "Boulder Conglomerate" group of deposits in the Western Himalayas. This work supports the findings and conclusions of De Terra in the Kashmir Himalayas in 1936 and traces for the first time the effect of Pleistocene glaciation on the lower hills and on the glacial character of "Boulder Conglomerate" beds in the Eastern Himalayas. (Author's abstract, modified)

SIP 22853

551.33:551.34(437)

Kaandr, Jiri  
CONCERNING THE GLACIAL AND PERIGLACIAL PROBLEM IN CZECHOSLOVAKIA. (Über die glaziale und periglaziale Problematik in der Tschechoslowakei; Text in German with English abstract). *Biuletyn Peryglacjalny (Łódź)*, No. 11:229-237 incl. illus., diagrs., map, 1962. 7 refs.  
DLC, QE1.B55

Czechoslovakia has a very advantageous position for the study of glacial and periglacial phenomena. In the Pleistocene period, the CSR was situated between the Scandinavian glacier and that of the Alps. The northern glacier penetrated up to the inland. The higher mountains, especially Sumava and Krkonose, were glaciated separately. In Slovakia, most of the High Tatras was covered with glaciers. Of the 21 valleys formed, the longest was 14 km in length. Traces of ice-action were discovered by Zejner more than 100 yr ago. Partsch, the most eminent of the researchers, solved the problem of the number of glacial periods and of the recessional phases of the last (Würm) glaciation. In their recent works, Romer and Halicki disagree that there were 2 or 3 glacial periods. The author has recognized that a series of Würmian moraines and their recessional stages are analogous to those of Bühl, Gachnitz, and Daun in the Alps. Presently, only firn fields are found in the High Tatras. Some have survived many years and have developed various morphological formations such as true glaciers. The most widespread of the periglacial phenomena observed during the last century are ice wedges. In the mountainous areas, frostsoil forms are found directly on the surface. The polygonal soils of the Krkonose were described by Högboom in 1914. Numerous frost-soil forms have been discovered in recent years, especially in the area of the Tatras national Park. (Author's abstract, modified)

SIP 22854

551.33(\*41)

Lee, Hulbert A.  
METHOD OF DEGLACIATION, AGE OF SUBMERGENCE, AND RATE OF UPLIFT WEST AND EAST OF HUDSON BAY, CANADA. *Biuletyn Peryglacjalny (Łódź)*, No. 11:239-245 incl. illus., graph, diagrs., map, 1962. 20 refs.  
DLC, QE1.B55

Directions of ice movement during the maximum stage of the Wisconsin (last) glaciation are deduced from the transport of erratics, the positions of the outer terminal moraines, and from the area of greatest isostatic readjustment. The successive positions of the ice margins during deglaciation are clarified with the help of De Geer moraines below the marine limit and by another type of minor moraine in the supra-aquatic area. The continental ice sheet split into 2 parts at the time the Hudson Bay Basin became free of the

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last ice sheet. The final positions of the ice margins west of Hudson Bay are marked by minor moraines, ice-dammed lakes, glaciofluvial channels, and shifts in directions of striae. This position of the last ice west of Hudson Bay has been named the "Keewatin ice divide." Geological investigations, archaeological studies, and radiocarbon dates indicate a similarity of events around Hudson Bay which began at the time the Hudson Bay Basin was freed of the continental ice sheet. The subsequent rate of land emergence has been measured by dating organic, shell, and bone materials related to strand lines. The rate of uplift decreased from an initial rapid uplift of 600 cm/century to 30 to 90 cm/century. The occurrence of slightly warmer climate than present around 3000 B.C. is indicated by the radiocarbon age of buried plants which now have a more southerly distribution. (Author's abstract, modified)

and shape of moraine ridges does not correspond with the size of the adjacent glaciers. Very large moraines were found beside small glaciers and vice versa. The shapes of the moraine ridges suggest that they consist of ice cores covered by thin layers of morainic material. Seismic and electric resistivity measurements proved that ice cores are present in many moraines. A map was drawn of such features. The soil resistivity method was used to locate frozen ground under thawed surface material. By digging in a frozen lateral moraine ridge, core samples were obtained from the buried ice. A crystallographic analysis proved that the ice was formed from in situ snow, not from glacier ice. (Author's abstract)

SIP 22855

551.331(411)

Linton, David L.  
GLACIAL EROSION ON SOFT-ROCK OUTCROPS IN CENTRAL SCOTLAND. *Biuletyn Peryglacjalny* (Łódź), No. 11:248-257 incl. maps, 1962. 5 refs.  
DLC, QE1.B55

The landforms in this area are described which, from their form and situation, seem to be attributable to glacial erosion. They are divided into 3 generic groups: ice-molded valley sides (visible on the northern and southern sides of Strath Allan), tapered interflues, and bridge interflues. These features, although they are extensively surfaced by and (in the case of the tapered interflues) partly built of glacial drifts, are essentially solid rock residuals surviving in favored situations between powerful ice streams. The courses of the latter are presently followed by valleys whose floors are at abnormally low levels for their distance from the open North Sea. Evidence on the Grampian Highlands side suggest that the more level tops of the tapered and bridge interflues are surviving remnants of the floor of the pre-glacial lowland. This reconstruction permits an estimation of the magnitude of glacial erosion in the area. The pre-glacial main streams probably descended from 150 m to 100 m above the present-day sea level. The Forth and Earn valleys are wide and flat and below 30 and 50 m respectively almost to the highland boundary.  
--BLE

SIP 22856

551.332.51(\*57)

Östrem, Gunnar  
ICE-CORED MORAINES IN THE KEBNEKAJSE AREA. *Biuletyn Peryglacjalny* (Łódź), No. 11:271-278 incl. illus., graphs, diagr., maps, 1962. 13 refs.  
DLC, QE1.B55

A study of air photographs from the Kebnekajse district in northern Sweden has revealed that the size

SIP 22857

551.34(\*57)

Rapp, Anders  
KÄRKEVAGGE. SOME RECORDINGS OF MASS-MOVEMENTS IN THE NORTHERN SCANDINAVIAN MOUNTAINS. *Biuletyn Peryglacjalny* (Łódź), No. 11:287-309 incl. illus., tables, graphs, maps, 1962. 4 refs.  
DLC, QE1.B55

The development has been followed since 1952 of slopes in the trough valley of Karkevagge in Swedish Lappland. The momentary mass movements (rockfalls, eroding snow avalanches, mudflows, and earth slides) have been recorded by direct observations, inventories of the fresh debris deposited upon snow at the end of spring or upon vegetation in summer, comparison of old and new photographs of the same slope, and measurements of the quantity of fresh rockfall debris upon sack carpets. The more continuous processes (talus creep, and solifluction) have been recorded by checking the annual position of wooden stakes and painted boulders. The results are given from (1) a steep rocky all with a gullied talus characterized by rockfalls, mudflows and gullying, (2) a steep slope with a small stream where snow avalanches are important for the morphology, and (3) a recording of talus creep on a talus cone and solifluction on a till-covered slope. (Author's abstract, modified)

SIP 22858

551.34(\*57)

Rudberg, Sten  
A REPORT ON SOME FIELD OBSERVATIONS CONCERNING PERIGLACIAL GEOMORPHOLOGY AND MASS MOVEMENT ON SLOPES IN SWEDEN. *Biuletyn Peryglacjalny* (Łódź), No. 11:311-323 incl. illus., tables, graph, diagr., map, 1962. 29 refs.  
DLC, QE1.B55

This paper is based on a review of the literature and on field observations. The account concerns frost weathering, assorting processes, and down-slope movement. The observed periglacial phenomena are grouped in 3 climatic-morphological zones. In the

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frost-shatter zone, frost weathering is everywhere visible where outcrops are found. In the tundra zone, the result of frost weathering can be observed where suitable outcrops occur in the drift covered areas. Frost weathering in the forest zone occurs primarily on steep slopes. Brief remarks are made on the morphological activity of snow cover in the mountains. --BLE

SIP 22859

551.34(73)

Smith, H. T. U.  
PERIGLACIAL FROST FEATURES AND RELATED PHENOMENA IN THE UNITED STATES. Biuletyn Peryglacjalny (Łódź), No. 11:325-342, 1962. [110] refs.  
DLC, QE1.B55

In areas within and beyond the border of the continental ice sheet in the U. S., the following types of periglacial features have been found: stabilized talus, gliding blocks and block concentrations on low to moderate slopes, now mobile; boulder fields or block streams in valley bottoms; transverse boulder benches in valley bottoms; "rock cities" on the rims of uplands; involutions or "cryoturbations;" casts of ice wedges; and other features. Definite indicators of permafrost are few and occur only within and near the glacial boundary. In upland areas associated with alpine glaciation, various types of patterned ground, mostly relict, are common; other features include hollows, boulder pavements, rock streams, and rubble sheets. Talus, protalus ramparts, and rock glaciers are common along the sides and at the heads of glaciated valleys. Relict features dating back to colder intervals of the Pleistocene occur in many places. (Author's abstract)

SIP 22860

551.34(\*3)

Tedrow, J. C. F.  
MORPHOLOGICAL EVIDENCE OF FROST ACTION IN ARCTIC SOILS. Biuletyn Peryglacjalny (Łódź), 11: 343-352 incl. illus., diagr., 1962. 27 refs.  
DLC, QE1.B55

The major genetic soils (tundra, bog, arctic brown, and miscellaneous) in the Arctic are described and the major kinds of frost displacement (down-slope movement, frost features in tundra soils, melting of ground ice, soils near thaw lakes, polygons, stone rings and stripes, and frost boils) are discussed. --BLE

SIP 22861

551.343.2 778.35(489)

Svensson, Harald  
SOME OBSERVATIONS IN WEST-JUTLAND OF A POLYGONAL PATTERN IN THE GROUND. Geografisk Tids. 62:122-124 incl. illus., 1963. 5 refs.  
DLC, G25.D19

As a result of a comparative study of aerial photographs of the areas in Jutland where Norvang (1939 and 1942) made observations of continuous crack fillings, a polygonal pattern has been observed for the first time. Generally the contours are indistinct and cannot be detected on the ground. The photographed areas are all situated west of the main stationary line of the last glaciation. --BLE

SIP 22862

624.139:624.133(\*50)

Belfakov, I. I.  
USE OF ROTARY EXCAVATORS IN WINTER. (Primenenie rotornykh ekskavatorov v zimnee vremya; Text in Russian). Moscow, Gos. nauchno-tekhn. izdvo lit-ry po gornomu delu, 1962. 93 p. incl. illus., tables, graphs, diagrs. 36 refs.  
DLC, TA725.B38

Rotary excavators are used in open excavations for the duration of the working season and scheduled for operation when minus temperatures affect the ground least. Measures are described for increasing the operational time in the extraction of fire clay, mining of brown coal, general excavation and similar work. For enabling engineers and technicians to use the equipment efficiently, design features, and advantages and disadvantages of different procedures are explained in order to determine the cutting forces required for working thawed and frozen ground. Planning of work and methods of ground preparation are emphasized. --VDP/FMM

SIP 22863

551.594.254(\*772)

Herman, John R.  
ON THE ELECTRICAL PROPERTIES OF BLOWING SNOW. Ann. Geophys., 20(3):235-241 incl. tables, graphs, July-Sept. 1964. 16 refs.  
DLC, QC801.A64

Radio noise measurements obtained at Byrd Station during blowing snow are used to deduce some of the electrical properties of the Antarctic blizzard by making the assumption that each charged snow particle striking the antenna gives rise to a measurable noise pulse. The noise intensity is related to the electrostatic charge on blown snow particles, and is used to determine the average charge magnitude on individual particles and the space charge. It is found that the space charge during a particular blizzard was  $5(10^{-10})$  coul./m<sup>3</sup>. Average charge per particle is on the order of  $10^{-15}$  coul. which is two to three orders of

# CRREL BIBLIOGRAPHY

magnitude greater than that found on quietly falling or "squal" snowflakes. (Author's abstract)

SIP 22864 551.324.28.551.321.6:621.396.969(\*729.5)

Walford, M. E. R.  
RADIO ECHO SOUNDING THROUGH AN ICE SHELF.  
Nature, 204(4956):317-319 incl. illus., tables, graphs, map, Oct. 24, 1964. 6 refs.  
DLC, Q1.N2

In Dec. 1963, a 200 mi tractor traverse was made near Base Z (Halley Base Station) to obtain radio echo soundings through the Brunt Ice Shelf (Caird Coast). The techniques are described by Evans (see SIP 21007) and the parameters of the apparatus are listed. The range of a radar target was indicated by the echo delay-time, with an accuracy determined mainly by the rise time of the receiver. Range information was obtained in the form of a time-interval displayed on a cathode-ray tube as a fraction of the period of a crystal oscillator. The determinations were affected by variations in the ice density and by the slope of the bottom surface of the ice shelf, thus creating a large uncertainty in the results. There are difficulties in accounting for large variations in mean echo strength from place to place on an almost uniform ice shelf. The occurrence of echo groups can be correlated with lower barometric pressures. The radio echo technique has failed to indicate the ice thickness, presumably due to an absorbing layer at least 10 m thick at the bottom of the shelf which presents no sharp discontinuity in electromagnetic impedance and thus reflects no energy. The shelf bottom beneath surface ridges, however, may be composed of inland ice which could account for the observed echoes. (See also SIP 21468)--MFG

SIP 22865 551.324.24:551.321.6:621.396.969(\*2)

Bailey, J. T., S. Evans and G. de Q. Robin  
RADIO ECHO SOUNDING OF POLAR ICE SHEETS.  
Nature, 204(4957):420-421 incl. illus., Oct. 31, 1964. 3 refs.  
DLC, Q1.N2

Trials of radar sounding equipment were made along 130 mi from Camp Tuto to Camp Century, Greenland, then to distances 40 mi south and 50 mi northwest of Century, and back to Tuto. The parameters included radio frequency 35 Mc/s and energy pass band 14 Mc/s. A balanced-feed antenna was used supported at least 3 m above snow surface. The receiver and control circuits were transistorized, and a continuously moving photographic film recorded echoes displayed on an intensity modulated cathode ray tube. A continuous subglacial profile was obtained by seismic shooting. The limitations arise from the loss of signal

strength by dielectric absorption of the radio wave in the ice. Echoes were obtained through 1400 m of ice, with a strength up to 30 db above receiver noise level, where the mean temperature of the upper part of the ice sheet was -24° C. Difficulty was experienced in following a bottom echo through an ice thickness of 500 m at temperatures close to 0° C. Several other aspects of the experiment are discussed. --GAD

SIP 22866

551.345.1.001.5

Poltev, N. F.  
PRENCIPLES OF A PERMAFROST SURVEY (Osnovy merzlotnoy s'emki; Text in Russian). Moscow, Izd-vo Moskovskogo Universiteta, 1963. 100 p. incl. graphs, diagrs. 29 refs.  
DLC, GB641.P6

The manual is divided into four chapters: 1. Aspects of permafrost investigations. 2. Classification of the types of seasonal freezing and thawing layers and the processes involved, which include temperature fluctuations, snow cover action, vegetation, land slopes and soil factors. 3. Methods of studying the permafrost rocks to show strata thickness, composition, structure and texture. 4. Study of the formations in a permafrost survey, covering ground heaving, frost clefths, thermokarst, and naleds. --VDP

SIP 22867

551.345:53(\*50)

Tsytoich, N. A.  
CHARACTERISTICS OF THE PHYSICAL PROPERTIES OF STRUCTURALLY UNSTABLE GROUND: PHYSICAL PROPERTIES OF FROZEN GROUND (Osobennosti fizicheskikh svoystv strukturno - neustoychivyykh gruntov; fizicheskie svoystva merzlykh gruntov; Text in Russian). p. 90-104 incl. graphs, table. (In: Mekhanika gruntov, Moscow, Gos. Izd-vo literatury po stroitel'stvu, arkhitekture i stroitel'nym materialam, 1963). 22 refs.  
DLC, TA710.T78

Seasonally frozen ground (almost all of the USSR) and permafrost (more than 45% of the USSR), the thickness of which can vary from a few meters to several hundred meters, is classified as unstable because above the freezing point the structure changes radically, and settling and sagging occur. Frozen ground consists of substances existing in three phases: solid (ice), liquid (unfrozen water) and gaseous (water vapor). Ice is the most important element, being the main cementing force governing the properties which differentiate frozen from ordinary ground. Some water always remains liquid in frozen ground even at temperatures below freezing. According to studies made by the Institute of Permafrostology, different ground at temperatures varying from -0.3 to -30° C contained from 0.5% (in sands) to 35% (in clays) unfrozen water. Below the freezing point the amount of ice increases as does the strength of the ground.

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Frozen clays therefore have far less strength than frozen sands. Moisture translocation is mainly governed by osmotic pressure occurring during the cooling process and causes the formation of ice lenses and bands. Ice content in frozen grounds can be determined by proposed formulas and with sufficient accuracy by the calorimeter. --VDP

SIP 22868

551.578.4:551.52(\*531.3)

Chistfakov, G. E.  
HYDROMETEOROLOGICAL CHARACTERISTICS (Gidrometeorologicheskaya kharakteristika; Text in Russian). p. 22-31 incl. tables. (In: Vodnye resursy rek Yakutii, Moscow, Izd-vo "Nauka," 1964, Chap. V).  
DLC, GB1356, Y3C45

Temperature of the air, precipitation, water vapor and evaporation, wind, and fogs in Yakutia are discussed. The coldest temperature recorded ( $-67.6^{\circ}\text{C}$ ) was at Verkhoyansk. The lowest temperature observed in central Yakutia was at Churapcha ( $-66^{\circ}\text{C}$ ); in western Yakutia, at Olenok hydrometeorological station ( $-64^{\circ}\text{C}$ ); in the Vilyui River valley ( $-61^{\circ}\text{C}$ ); in southern Yakutia not below  $-66^{\circ}\text{C}$ ; and along the coast of Laptev and East Siberian Seas ( $-53^{\circ}\text{C}$ ). The snow cover for sheltered points is between 29 and 72 cm; for open areas, between 24 and 51 cm; and between 8 and 27 cm on the islands and along the sea shore. The mean duration of the snow cover is, in the polar regions, 230 days; in the south-east, 200 days; in the central part, 207 days; in the south, 208 days; and in the hills more than 230 days. The short depth of snow cover at points situated on islands and on the sea shore can be explained by the small amount of snowfall and frequent winds blowing the snow. Permanent snow cover occurs only in eastern Yakutia in areas of modern glaciation. --VDP

SIP 22869

551.345(\*531.3)

Chistfakov, G. E.  
PERMAFROST (Mnogoletnnaya merzlota; Text in Russian). p. 19-21 incl. illus. (In: Vodnye resursy rek Yakutii, Moscow, Izd-vo "Nauka," 1964, Chap. IV).  
DLC, GB1356, Y3C45

The territory of Yakutia is a permafrost region 100 to 600 m in depth: in the south and vicinity of the Lena River, 100 to 200 m; in the tundra and tundra forest zones, 300 to 500 m; in the mountain zone of the north-east, 200 to 500 m; and in the central part, 200 to 500 m. Taliks penetrate the permafrost layer partially or from top to bottom and in southern Yakutia occupy up to 50% of the area but are seldom found in the south-western part. Their quantity and size decrease in the north where they are mostly found under the bed of large rivers and deep lakes. In the tundra and the tundra forest area they occur less frequently.

With the beginning of winter the upper layer of the ground freezes, and in January usually interlocks with the permafrost table. The snow cover substantially decreases the depth of freezing. In areas of no snow cover the thickness of seasonally frozen layer is from 50 to 60% greater. The depth of the seasonal thawing varies between 1 and 2 m in a large part of Yakutia but does not exceed 30 to 80 cm in the northern tundra and tundra forest areas. It reaches 2.5 to 4 m in the sandy grounds of the southern and western areas of greater precipitation. The thickness of the active layer depends essentially on the slope exposure in mountain regions. The depth of the thawing is usually from 1.5 to 3 times less under vegetation, and at depths of 15 to 40 cm, the ground temperature is 5 to 15 $^{\circ}\text{C}$  lower. Tree cutting and fires increase the thawing depth and can lead to landslides, formation of lakes and other landforms. --VDP

SIP 22870

551.326.83(\*531.3)

Chistfakov, G. E.  
THERMAL AND ICE REGIME (Termicheskiy i ledovyy rezhim; Text in Russian). p. 133-144, 170-195 incl. tables, graphs, appendix. (In: Vodnye resursy rek Yakutii, Moscow, Izd-vo "Nauka," 1964, Chap. XII and Annex Table II).  
DLC, GB1356, Y3C45

Temperatures of rivers and lakes of Yakutia from May to October are tabulated and compared to air temperatures. The formation of slush, sludge and shore ice precedes by a few days the freezing of most of the rivers during October. Complete freezing occurs for the Lena River in the lower stretches in October through the first half of November in the upper stretches. The thickening of the ice cover becomes very rapid immediately after complete freeze-up. However a maximum thickness over 200 cm can be observed only in a few rivers. The ice thickness depends on the air temperature and snow cover depth. Ice break-up, which begins in the upper stretches of most of the rivers, results in the formation of large ice jams, especially in the Lena, Aldan, and Alekma Rivers with the consequent accumulation of large ice masses, sometimes several meters high, on the river banks. Ice break-up occurs for the Lena River from May in the upper stretches through the beginning of June, near the estuary, complete break-up taking about 40 days. Data and formulas on the ice conditions are given. --VDP

SIP 22871

\*24.147:534.2:539.411

Smith, James L.  
CRUSHING STRENGTH AND LONGITUDINAL WAVE VELOCITY IN PROCESSED SNOW. Tech. Rept. 137. U. S. Army Cold Regions Research and Engineering Laboratory. 11p. incl. illus., tables, graphs. Jan. 1965. 8 refs.  
CRRÉL files

# CRREL BIBLIOGRAPHY

This study establishes a relation between the longitudinal wave velocity and the crushing strength of processed snow at a common density and temperature, provides information on the aging effect of processed snow under controlled temperatures, and shows how sonic measurements can be taken continuously through one sample during the aging process. The study was conducted at Houghton, Michigan, on snow processed by the Peter snow miller and deposited in plywood boxes 1.5 x 1.5 x 1.5 ft. Two sets of samples were obtained (series A, initial density 0.543 g/cm<sup>3</sup>; series B, initial density 0.510 g/cm<sup>3</sup>), each consisting of 6 boxes of processed snow. A constant-velocity motorized press was used to determine the crushing strengths. The specimens were prepared with a length to diameter ratio of 2.5 to 1, and the measurements were independent of the loading rates. The longitudinal wave velocity was measured with piezo-electric transducers in conjunction with a sonoscope, which provided the exciting source and the time-measuring device. A relation between the longitudinal wave velocity and crushing strength at -10°C was established as  $\sigma_c = (C_1 - C_0)/\lambda$  where  $\sigma_c$  is the crushing strength in psi,  $C_1$  is the longitudinal wave velocity in ft/sec, and  $C_0$  and  $\lambda$  are constants, depending on the initial density of the test specimen. (Author's abstract)

SIP 22874

531.39:54-16:534.1

Lee, T. M.

DILATATION CONSTANTS AND COMPLEX RATIO FROM FORCED VIBRATION OF A FREE VISCO-ELASTIC SPHERE. Res. Rept. 147, U. S. Army Cold Regions Research and Engineering Laboratory, 8p. incl. tables, graphs, Jan. 1965. 3 refs. CRREL files

The technique of forced vibration has been applied to the study of the properties of viscoelastic materials. It was found, through the analysis of a free sphere with a harmonic oscillating internal source, that the vibration amplitude ratio of two measuring points is associated with the complex dilatational constants and the complex ratio of the material, a quantity directly related to Poisson's ratio. From the criterion of maximum amplitude ratio (i.e., by adjusting the frequency of the source until the amplitude ratio reaches maximum), these properties can be expressed in terms of the amplitude ratios and their frequencies. For the convenience of laboratory testing, two particular amplitude ratios, in conjunction with their frequencies, have been employed for this purpose. Simple expressions are given, relating the properties of the test material to quantities measurable in the laboratory, namely, the maximum amplitude ratios and their corresponding frequencies. (See also SIP 21837 and 21849) (Author's abstract)

SIP 22873

551.574.7:621.315.1

Kuroiwa, Daisuke

ICING AND SNOW ACCRETION ON ELECTRIC WIRES. Res. Rept. 123, U. S. Army Cold Regions Research and Engineering Laboratory, 10p. incl. illus., graphs, diagrs., Jan. 1965. 5 refs. CRREL files

Experimental data on icing and snow accretion on electric wires and antennas is presented. The accumulation of supercooled droplets on a single wire stretched in an air flow has been calculated as icing in the form of soft rime, hard rime, and glaze, per unit time and unit length of wire. The difference between calculated values and observed values in Japan is discussed in terms of ice deposit, wire tension, and wind velocity and pressure. Iced wire will be cut more often by dynamic wind pressure than by the deposited ice load. The differences between icing and accretion of snow are discussed, the wire failures being attributed to the heavy weight of snow accretion. This phenomenon will be less frequent in polar regions than in temperate regions because the main cause of snow accretion — existence of a liquid-water film on the surface of snow flakes — is less prevalent. A simple experiment for anti-icing an electric wire by means of electrical heating is briefly described. (Author's abstract)

SIP 22874

551.34(73)

Black, Robert F.

PERIGLACIAL STUDIES IN THE UNITED STATES 1959-1963. Biuletyn Peryglacjalny (Łódź), No. 14: 5-29, 1964. 157 refs. DLC, QE1.B55

Terminology of periglacial phenomena has been ignored, and few studies specifically concern the solution of periglacial problems. Nonetheless, voluminous literature is available on cold-climate chemical and physical weathering, soils, frost action, permafrost, and mass-wasting processes. Present rates of erosion and movement of material by frost and gravity in cold climates are being studied quantitatively at an increasing tempo, and similar techniques are being used to check on present rates of soil movement in former periglacial areas. Indirect evidence of former periglacial erosion comes from the study of asymmetrical valleys, stone lines, general morphometry, etc. Detailed comprehensive laboratory and field investigations into frost processes are underway. Active periglacial phenomena include all those phenomena characteristic today of very cold climates, whether wet or dry, but excluding glaciers. The inactive periglacial phenomena most studied include sorted and non-sorted patterned ground, especially ice-wedge casts, sorted polygons, congeliturbation, and solifluction phenomena. Numerous papers provide data on periglacial paleoclimates of local areas or regions. (Author's abstract)

# CRREL BIBLIOGRAPHY

SIP 22875

551. 34:016(\*41)

Cook, Frank A.  
PERIGLACIAL RESEARCH IN CANADA: 1954-63.  
A SELECTED BIBLIOGRAPHY. Biuletyn  
Peryglacjalny (Łódź), No. 14:31-40, 1964.  
DLC, QE1. B55

This bibliography consists of 122 entries and is divided into the following sections: general, regional studies, references on individual forms, climate and frost cycles, pingos and ground ice, string bogs, and mapping. Important papers in the general section include reviews of periglacial research in Canada, an English-French vocabulary, and a definition of the word "périglaciaire" with a discussion of its origin and derivatives. It is pointed out that considerable literature has developed on the various problems created by permafrost, and that muskeg is intimately associated with permafrost conditions under a periglacial climate and probably can be considered a periglacial feature. -- BLE

SIP 22876

551. 34:016(\*548)

Rapp, A. and S. Rudberg  
STUDIES ON PERIGLACIAL PHENOMENA IN  
SCANDINAVIA. Biuletyn Peryglacjalny (Łódź), No.  
14:75-89 incl. illus., table, map, 1964. 94 refs  
DLC, QE1. B55

The paper is a report on and a bibliography of periglacial studies by Scandinavian authors. The bibliography includes several stenciled reports on inventories of periglacial phenomena which were made by students in Göteborg and Uppsala. Comments are given concerning certain parts of the bibliography, e.g., the distribution of patterned ground (forms due to seasonal frost and permafrost forms), actual frost shattering of rockwalls, mapping of small-scale periglacial phenomena in selected areas, detailed investigations of selected forms and altitudinal zones, measurements of actual solifluction movements, and studies on Axel Heiberg Island, Canada. (Authors' abstract, modified)

SIP 22877

551. 34(437)

Sekyra, Josef  
ON THE PERIGLACIAL INVESTIGATION IN  
CZECHOSLOVAKIA (1955-63). Biuletyn Peryglacjalny  
(Łódź), No. 14:99-108, 1964. 87 refs.  
DLC, QE1. B55

A survey is presented of the investigations and literature concerning periglacial phenomena in Czechoslovakia from 1955 to 1963. Most of the papers deal with new establishments of cryopedological forms in various regions and in different rock types (e.g., new occurrences of ice wedges, solifluction and involution structures, block streams

and block fields, thufurs, garland soils, etc.). Emphasis is also placed on periglacial phenomena in denudation areas (mountain regions), cirques and the nivation remodelling of valley heads, karst areas, the stratigraphical evaluation of cryogeological structures, and periglacial sediments. -- BLE

SIP 22878

551. 34(410)

Waters, Ronald S.  
GREAT BRITAIN. Biuletyn Peryglacjalny (Łódź),  
No. 14:109-110, 1964. 20 refs.  
DLC, QE1. B55

This is a brief summary of periglacial investigations concerning the effects of cryergic processes on the landscape of Great Britain. Attention is focussed on the wide distribution of relict periglacial phenomena, solifluction spreads, the effect of current frost action on sorted stripes and low angle scree, altiplanation terraces, the former existence of permafrost, and conditions for patterned ground. -- BLE

SIP 22879

551. 34:001.4:440

Hamelin, Louis-Edmond  
THE FAMILY OF THE WORD "PERIGLACIAL."  
(La famille du mot "périglaciaire"; Text in French).  
Biuletyn Peryglacjalny (Łódź), No. 14:133-152, 1964.  
23 refs.  
DLC, QE1. B55

A section has been studied of the total periglacial vocabulary by examining the word "periglacial." In spite of known inconveniences, the use of the term is recommended; in fact it is generic whereas the related roots or words (cryo, geli, nivo, glace, sol, and polygone) only express the particular process or aspect. Unfortunately, the family of the word "periglacial" has never been systematically developed. Two conceptions of the term exist: (1) The teaching of periglaciology which, utilizing various sciences (climatology, glaciology, cryology, engineering, geography, geomorphology, hydrology, and pedology) conveys a better understanding of cold regions. (2) Periglaciology is also the object of research which considers the composition of landscapes and their origin, area, and age. During the last 50 yr, the significance of the term "periglaciology" has evolved with complex modifications. Derivation, composition, suffixes, prefixes, and definitions are presented for various compound and related terms (Author's abstract, modified)

# CRREL BIBLIOGRAPHY

SIP 22880

551. 34(437)

Czudek, Tadeáš  
PERIGLACIAL SLOPE DEVELOPMENT IN THE  
AREA OF THE BOHEMIAN MASSIF IN NORTHERN  
MORAVIA. Biuletyn Peryglacjalny (Łódź), No. 14:  
169-193 incl. illus., graphs, 1964.  
DLC, QE1. B55

The results are given of research on slope development under Pleistocene periglacial conditions in the Hrubý and Nízky Jeseník Mountains. A summary of the general geologic and geomorphic characteristics is followed by a description of the frost riven cliffs, tors, altoplanation terraces, block fields, talus, periglacial processes on gentle slopes, and the asymmetry of valley sides and dells. The periglacial geomorphic processes are reflected by their strong modelling on the slopes of the areas studied which led to the rise of the present slope forms. These forms vary from place to place depending on local geologic and geomorphic conditions. (Author's abstract, modified)

SIP 22881

551. 34:551. 583. 7(492)

Maarleveld, G. C.  
PERIGLACIAL PHENOMENA IN THE NETHERLANDS  
DURING DIFFERENT PARTS OF THE WÜRM TIME.  
Biuletyn Peryglacjalny (Łódź), No. 14:251-256 incl.  
graph, map, 1964. 12 refs.  
DLC, QE1. B55

Evidence of periglacial phenomena during Würm time are widespread and occur in numerous deposits. Sands of Early Würm age have been described which occur in the Amersfoort tunnel pit. A soil profile was formed in its upper part during Brörup time. The layer contains clearly developed frost wedges which were formed subsequent to Brörup time. The Lower Würm loess is overlain by a layer with distinct traces of solifluction and contains very clearly developed frost wedges. Forms showing some resemblance to frost wedges also frequently occur in Late Dryas deposits. These pseudo frost wedges differ in that no pressure deformations are found, there is no buckling of the layers, and the wedge shape is indistinct. It is concluded that the Würm included at least two periods of considerable frost-wedge formation. The first period is younger than the Brörup interstadial, and the second period post-dates the Paudorf interstadial. The climate was probably very cold during these periods and there was possibly a thin snow cap. Wind-faceted stones are encountered below the eolian sandy deposits and their wide-spread occurrence fits the pattern of the then prevailing continental climate. -- BLE

SIP 22882

551. 34(439. 1)

Pécsi, Márton  
CHRONOLOGICAL PROBLEMS OF THE PATTERNED  
SOILS OF HUNGARY. Biuletyn Peryglacjalny (Łódź),  
No. 14:279-293, incl. diagra., 1964. 20 refs.  
DLC, QE1. B55

Research in patterned soils is discussed which has established a chronological succession of the cryoturbation phenomena in Hungary. Cryoturbation phenomena (e.g., ice wedges, solifluction, polygons, etc.) are described which were formed during Late Würm time, Early and Middle Würm time, the Riss Glaciation, and the Lower Pleistocene and earlier. The chronology of plain and slope terraces in Hungary is outlined. -- BLE

SIP 22883

551. 34(235. 2)

Sekyra, Josef  
CRYOGEOLOGICAL PHENOMENA IN THE NORTH  
PAMIR (CENTRAL TRANS-ALAI). Biuletyn  
Peryglacjalny (Łódź), No. 14:311-319 incl. illus.,  
1964. 13 refs.  
DLC, QE1. B55

The results are presented of cryogeological investigations conducted Aug.-Sept. 1961. In addition to the orientation investigations at the northern piedmont of the Tien-Shan, in the Fergann basin, and in the Pamiro-Alai, the central parts of the high mountain Alai depression and the Trans-Alai (Achik-Tash area) were investigated in greater detail. The main phases of the mountain or piedmont glaciation were determined according to the formation of cirques and troughs; the altitude of the snow line (4520 m above sea level) was determined; the relative values for the depressions of the fossil snow line were computed; and basic data on glacier tongues were obtained. Forms observed for the first time in the Pamir area include microwedge forms, thufurs, fossil macropolygons and solifluction structures, glaciocolluvium in the ablation part of glaciers, and various forms of gelivation close to and above the snow line where a normal disintegration by hyaline ground ice no longer takes place. -- BLE

SIP 22884

551. 34(\*548)

Svensson, Harald  
AERIAL PHOTOGRAPHS FOR TRACING AND INVESTIGATING FOSSIL TUNDRA GROUND IN SCANDINAVIA. Biuletyn Peryglacjalny (Łódź), No. 14:321-325 incl. illus., 1964. 18 refs.  
DLC, QE1. B55

Evidence of relict and present periglacial phenomena in northern and southern Scandinavia is summarized, based on the interpretation of aerial photographs and subsequent ground inspection. Large scale ice-



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wedge polygon patterns have been identified in vegetated areas as well as in raised shore terraces, raised beaches, mountain slopes, and gravel pits. The advantages, interpretation, and limitations of aerial photographs used for this purpose are discussed. It is pointed out that with the assistance of aerial photographs, it is possible not only to identify, but also to map the extent of the polygon ground although the direct source of the pattern no longer appears on the surface. -- BLE

SIP 22885

551. 34(\*35)

Thorarinnsson, Sigurdur  
ADDITIONAL NOTES ON PATTERN GROUND IN ICELAND WITH A PARTICULAR REFERENCE TO ICE-WEDGE POLYGONS. *Biuletyn Peryglacjalny* (Lódź), No. 14:327-336 incl. illus., diagrs., map, 1964. 13 refs.  
DLC. QE1. B55

The main types of polygons in Iceland are briefly described and their distribution is outlined. Ice-wedge polygons (tundra polygons) were recently discovered in the interior of the country. They occur both in subsoil (glacial and fluvial sediments) and in the loessial humus soil cover. The lower limit of the loessial soil polygons is about 300 m lower than the limit of those formed in the subsoil. At least for some types of ice-wedge polygons the climatic conditions necessary for their formation are probably not as severe as hitherto assumed. (Author's abstract)

SIP 22886

551. 34(410)

Williams, R. B. G.  
FOSSIL PATTERNED GROUND IN EASTERN ENGLAND. *Biuletyn Peryglacjalny* (Lódź), No. 14:327-349 incl. illus., diagr., map, 1964. 13 refs.  
DLC. QE1. B55

Fossil polygons and stripes of a distinctive type are found widely in eastern England. They are notable for their large size, and for the striking rendering by present vegetation. Representative sections were dug to expose the underground structures. Polygons are composed of superficial cover materials (aeolian sands or solifluction debris) lying in flat-bottomed troughs formed in chalky materials. Stripes are very similar. The origins of the structures are discussed. The forms are found to be essentially different from stone polygons, etc., and cannot be matched with any present Arctic patterns. Some 500 localities are known and all are restricted to chalky materials and the eastern half of the country. Possible reasons for this are suggested. A general Last Glaciation age for the patterns is indicated. Some, however, may have survived the Gipping (Saale) retreat. (Author's abstract)

SIP 22887

551. 578. 42(79)

Barton, Manes and Roy E. Malsor, Jr.  
SUMMARY OF SNOW SURVEY MEASUREMENTS FOR NEVADA AND PERTINENT MEASUREMENTS IN CALIFORNIA AND OREGON. U. S. Soil Conservation Service, Reno, Nev., 150p. incl. illus., tables, map.  
DLC. GB2425. N4A53

This summary of data from watersheds from 1910-1961 supersedes all previous Nevada summaries. The snow course data summary sheets were prepared by electronic data processing methods at the University of Nevada. The history of Nevada snow surveys is discussed, snow survey terms are defined, and a method of conducting a snow survey is outlined. The Nevada snow courses are indexed and mapped as well as the discontinued snow courses. Snow survey summaries of other basins and states are listed. -- BLE

SIP 22888

656. 7(091)(\*2)

Grierson, John  
CHALLENGE TO THE POLES; HIGHLIGHTS OF ARCTIC AND ANTARCTIC AVIATION. Hamden, Conn., Archon Books, 1964, 695p. incl. illus., maps, appendixes.  
DLC. TL532. G7

This is a complete record of the many outstanding feats of daring and endurance which constitute the history of Arctic and Antarctic aviation. The history is presented chronologically in 21 chapters from 1896, when Andrée attempted to reach the North Pole by balloon, to 1954 when a regular air service across the Arctic was opened by the Scandinavian Airlines System. A summary of flights and air expeditions to the Arctic and Antarctic during those years is presented in an appendix. Notable Antarctic flights include those of Wilkins (who made the first Antarctic flight, in 1928), Byrd, Christensen, Nansen, and Ellsworth. In addition, contributions to Antarctic aviation were made by the Rome expedition, ANARE, and the Norwegian-Swedish-British expedition. Aviation's future in the Arctic and Antarctic is promising, with prospects of the polar routes becoming regular pathways in commercial flights. Numerous photographs and maps supplement the text. -- JFS

SIP 22889

551. 332. 56(\*429)

Mathews, W. H.  
TWO SELF-DUMPING ICE-DAMMED LAKES IN BRITISH COLUMBIA. *Geographical Rev.* 55(1) 46-52 incl. diagr., maps, Jan. 1965. 4 refs.  
DLC. G1. G35

The characteristics and performance are outlined of Strohn Lake and Summit Lake, near the town of

# CRREL BIBLIOGRAPHY

Stewart, which recently became self-dumping. Strohn Lake, at the head of the Bear River valley, is ponded on the west by Bear River Glacier and has normally spilled eastward across Bear River Pass into Strohn Creek. Summit Lake lies at the head of the valley occupied by the Salmon River and the lower, southward-flowing part of Salmon Glacier. This lake spills northward across a rocky sill into the upper Bowser River. Ice melting, subsequent flooding, and meteorological conditions in the area are discussed with special emphasis on the mechanics of release. -- BLE

SIP 22890

551. 324:551. 33(\*49)

Miller, Maynard M.  
TAKU GLACIER EVALUATION STUDY. Conducted for the State of Alaska, Dept. of Highways in cooperation with the U. S. Dept. of Commerce, Bureau of Public Roads, [322]p. incl. illus., tables, graphs, diagra., maps, appendixes A-M, Jan. 1963. [187] refs.

DLC, GB2427. T3M5

Comprehensive evaluation of the Taku Glacier System recognizes four main glacier types: polar, sub-polar, sub-temperate, and temperate. The various sections are entitled Survey of Alaskan coastal glaciers; The regional pattern and its comparison with other areas; Relationship to the Little Ice Age and comparison with other maritime areas; Radiocarbon dating of earlier fluctuations in the Christian era; The Taku Glacier System, background information and previous data; Bedrock geology and regional structure of the Taku Valley and adjoining highlands; Geomorphological factors in the Taku District; and Regime of the Juneau Icefield. The appendixes include: Definitions and comments on terms used; comparative precipitation data in S. Coastal Alaska, S.W. Yukon Territory and northern British Columbia (1950-1961); Prominent intrusive and metamorphic rock types on nunataks of the Taku Glacier Systems; Types of glaciation and chronology during the Wisconsinan according to the elevation of old cirques and related stratigraphy; Elevations and ice depths at seismic stations on Taku Glacier; Corrections for reduction of Taku Glacier gravity data to comparable sea-level values; Elevation and ice thickness measurements from gravity surveys; Positions of the late summer névé line on certain glaciers in the Taku district; and Firn budget data on lower Taku névé. --BLE

SIP 22891

551. 322:548. 51:551. 576

Chao, Pai-lin  
THE MECHANISM OF ICE-FORMING NUCLEI AND ARTIFICIAL SUPER-COOLED CLOUD AND FOG. (Ch'eng ping ho tso yong chi chih chi jen kung ying hsiaang kuo leng wu; Text in Chinese). K'o hsueh t'ung pao (Science Bulletin), No. 6:495-500, June 1964. 17 refs. (Eng. transl.: Office of Tech. Services, U. S. Dept. of Commerce, Wash., D. C., JPRS 26, 193, Tech. Transl. 64-41452, p. 26-36, Aug. 28, 1964).  
DLC, Orientalia Div.

This report discusses problems of the formation mechanism of ice crystals. Included in the discussion are the crystallization process of supercooled fog whiteout nuclei; the effect on crystallization temperature of ice-forming nuclei in natural or artificially supercooled fog; catalysts with which the temperature of ice formation in supercooled fog can be increased; and laboratory and natural observations of ice-forming nuclei. --BLE

SIP 22892

550. 312:528. 414(\*7)

Pratt, J. G. D.  
A GRAVITY TRAVERSE OF ANTARCTICA. Trans-Antarctic Expedition 1955-1958, Sci. Rept. No. 2, 22p. incl. tables, graphs, diagra., map. 1960.  
DLC, Q115. T7, No. 2

This report discusses (1) the instrument (Worden gravimeter No. 14) used, the testing program, and drift observations, (2) the journey across the continent (the gravity base stations) and drift measurements made during the journey, and (3) attempts to read the gravimeter on floating ice in the Weddell Sea, on ice shelves, and on Ross Island to determine the extent of ice motion. Until reliable heights above sea level are available, no interpretation of the data can be made, and only very provisional values can be calculated. -- BLE

SIP 22893

551. 321. 62:528. 414(\*7)

Pratt, J. G. D.  
SEISMIC SOUNDINGS ACROSS ANTARCTICA. Trans-Antarctic Expedition 1955-1958, Sci. Rept. No. 3, 69p. incl. tables, graphs, diagra., map, appendixes I-III, 1960.  
DLC, Q115. T7, No. 3

The four parts of this report give comprehensive information on the seismic equipment and field techniques, reflection shooting on the Antarctic ice cap, refraction shooting at Southice, and ice-shelf shooting at Shackleton, respectively. Heights above sea level are not included and until these final values are obtained, interim data should not be published. Many explanations and definitions have been collected in

# CRREL BIBLIOGRAPHY

two appendices, a "Glossary" of technical terms and a list of the metric "Units" employed. Appendix III presents the "Ray Tracing Results." -- BLE

SIP 22894

551. 466. 7(\*826)

Pratt, J. G. D.  
TIDES AT SHACKLETON, WEDDELL SEA. Trans-Antarctic Expedition 1955-1958. Sci. Rept. No. 4, [23]p. incl. illus., tables, graphs, diagrs., 1960. DLC. Q115. T7. No. 4

The three parts of the report discuss (1) the field work including the apparatus, observations required, and a statistical summary of the results; (2) the preparation of the observations; and (3) harmonic analysis (which includes the Admiralty and the least squares methods). The sea-tide observations were made at the head of the Weddell Sea by reading a gravimeter on the freely floating ice shelf. All the usual methods were unworkable because there was no fixed marker within reach. The nearest visible land was a nunatak in the direction of Vahsel Bay, 25 mi away. A gravimeter was used to make the tidal measurements. The results fall into two distinct parts which are given separate consideration: the real tide and "spurious tides." -- BLE

SIP 22895

551. 324. 84:546. 621. 02. 26(\*38)

Fireman, Edward L. and Chester C. Langway, Jr.  
SEAPCH FOR ALUMINUM-26 IN DUST FROM THE GREENLAND ICE SHEET. Geochim. Cosmochim. Acta. 29(1):21-27 incl. table, graphs, diagr., Jan. 1965. 10 refs. DLC. QE351. G425

Large volumes of water from the Camp Century, Greenland, water supply system were filtered in an attempt to obtain dust samples from glacier ice about 250 yr old. About 20,000 l passed through 0.45- $\mu$  retention paper with a 2.5-ft surface area, and about 200,000 l passed through 3- $\mu$  retention paper. Less than  $4 \times 10^{-7}$  dpm/l of Al-26 was found in the 3- $\mu$  collections, and less than  $3 \times 10^{-6}$  dpm/l in the 0.45- $\mu$  collection. These limits are significant for determinations of the exposure age, the chemical composition, and the accretion rate of extraterrestrial dust. For an accretion rate for the earth of a million tons per year of silicates, the limit of  $4 \times 10^{-7}$  dpm/l corresponds to an exposure age of 4000 yr. Although the filter collections do not contain Al-26, they do contain radioactivities. The principal one is Tl-208, a Th decay product attributed to terrestrial material in the collection. There is also a small positron activity, which disappeared with the purification of Al. (Authors' abstract, modified)

SIP 22896

536. 24:551. 52:551. 55(\*7)

Vinje, Torgny E.  
THE COOLING POWER IN ANTARCTICA. Norsk Polarinstutt, Årbok 1961, p. 7-22 incl. tables, graphs, diagr., map, 1962. 18 refs. DLC. G575. O78

The cooling power at Norway Station was measured with kata-thermometers (Katas) for air temperatures ( $T_a$ ) between +1 and -41°C, and for wind speeds ( $v$ ) at the 10-m level up to 27 m/sec. The linear proportionality of the cooling power ( $H$ ) to  $(36.5 - T_a)$ , for a constant wind speed, is shown to hold within this temperature interval for a wind speed less than about 12 m/sec. Four Katas were used, each giving different values of the cooling power for equal meteorological conditions. The maximum deviation was about  $\pm 20\%$ . The differences are probably due to calibration errors, subjective errors, and dissimilarities in bulb shape. Based on two of the Katas, Kata-formulas for Antarctica and Europe are similar, despite the dissimilar climates of the two areas. The Kata-formula is  $H = (a + bv^m)\theta$ , where  $a$ ,  $b$ , and  $m$  are constants and  $\theta = (36.5 - T_a)$ . Lehmann found that  $m$  decreases with increasing vertical stability in the air mass. The Norway Station studies gave  $m = 0.42$ , which is lower than any of Lehmann's values, due probably to the relatively high vertical stability in Antarctica. Little or no effect was noticed of the short-wave radiation on cooling power when the latter exceeded 40 mcal/cm<sup>2</sup>/sec, so the formulas should give an expression of the cooling effect of the air and long-wave radiation only. Monthly and annual means of the cooling power were calculated for most Antarctic stations and some stations in Europe. At  $H < 25$ , sunbathing is possible in midsummer; at  $H < 65$ , there is risk of freezing of exposed human skin; at  $H > 110$ , there is risk of quick freezing of exposed human skin. (Author's abstract, modified)

SIP 22897

551. 324. 24:531. 73(\*7)

Liestøl, Olav  
THE VOLUME OF ICE IN ANTARCTICA. Norsk Polarinst., Årbok 1961, p. 164-165, incl. graph, 1962. DLC. G575. O78

Figures are given on the ice volume of Antarctica ( $20.2 \times 10^6$  km<sup>3</sup>), total area of the continent ( $13.82 \times 10^6$  km<sup>2</sup>), area of ice shelves ( $1.31 \times 10^6$  km<sup>2</sup>), areas uncovered by ice ( $0.20 \times 10^6$  km<sup>2</sup>), mean height of the continent (2040 m), and mean thickness of ice (1455 m). Disregarding isostatic movements following melting of Antarctic ice, the rise in sea level would be about 42 m. If all the earth's ice were to melt, the sea-level rise would be about 50 m. -- JFS

# CRREL BIBLIOGRAPHY

SIP 22898

551. 326. 85(439. 1)

Eutcz, Béla  
RESEARCH STUDIES ON THE ICE OF LAKE BALATON. (Tanulmányok a Balaton Jegének megismeréséhez; Text in Hungarian with English, French, German, and Hungarian abstracts). Vízügyi Közlemények, No. 2:269-283, 51, incl. illus., 1964. 13 refs.

DLC, GB726 H8V53

This study describes observations made during the past 16 yr of the winter ice cover on Lake Balaton (Hungary). A comprehensive picture is presented of ice formation and melting, and of the origin and shape of cracks in the ice cover. A series of photographs show the influences of the freezing process and the wind on the various ice formations, the origin of gas inclusions in ice etc., and the melting process. The last part of the paper discusses the noises which accompany the formation of cracks, which are very interesting on this lake. (Author's abstract, modified)

SIP 22900

551. 37(+50)

Moskvitin, A. I.  
THE PROBABLE AGE OF THE FIRST GLACIATION PERIOD ON THE RUSSIAN PLAIN. (Veroliatnyĭ vozrast pervogo oledeneniĭa Russkoĭ ravniny; Text in Russian). Biulleten' Moskovskogo Obshchestva Ispytatelei Prirody, Otdel Geologicheskii, 32(2):3-13 incl. illus., diagr., March-April 1957. 48 refs. (Eng. transl.: Israel Program for Scientific Translations, p. 152-165, Jerusalem, 1964. Office of Tech. Services, Dept. of Commerce, Wash. 25, D. C., OTS 63-11134/1-3, 1964).

DLC, Q60 M8

Facts are cited which prove the existence of a glacial climate during the Akchagyl, which are based on: the analysis of pollen from dark conifers in the Volga River area and the Caspian Sea area, and of cryoturbation in sediments. The Akchagyl stage can be related to the Mediterranean Calabrian and to the Amstelian stage in Holland. Evidence suggests that the first glaciation period on the Russian Plain occurred during the Akchagyl stage. Evidence also exists concerning the age of these glacial deposits (moraine consolidation and its erosion). The lowering of the base of the Pleistocene to below the Akchagyl stage is proposed. (Author's abstract, modified)

SIP 22899

551. 326. 33:624. 145. 8(439. 1)

Károlyi, Zoltán  
ICE CONDITIONS ON THE DANUBE RIVER, 1962-63. (A duna 1962. 63. évi jégviszonyai; Text in Hungarian with English, German and Russian abstracts). Vízügyi Közlemények, No. 3:287-300. 56, incl. tables, graphs, map, 1963.

DLC, GB726 H8V53

The ice cover developed in the third and most severe frost period (Jan. 9 to Feb. 2). Daily mean temperatures, temperature deficiencies, and the formation of drift and solid ice are illustrated. Solid ice developed during the second frost period (Dec. 20-30, 1962) downstream from the Hungarian-Yugoslavian border at Apatin, where the ensuing ice jams were blasted to form a 50-m wide channel. The solid ice cover which developed at the rate of 43 km/day justified preparations for an ice-carrying spring flood. From the smooth departure of the ice cover under the prevailing favorable meteorological conditions, it is concluded that the river training preparations resulted in considerable improvement but more channel regulation is needed. The new Hungarian ice breaker fleet successfully prevented the development of many ice jams and accelerated the breakup of others. (Author's abstract, modified)

SIP 22901

551. 23(+50)

Kař, N. Ā., S. V. Kař and I. N. Salov  
THE RISS-WÜRM (MIKULINO) INTERGLACIAL SEDIMENTS NEAR RYASNA VILLAGE, PONIZOV'E DISTRICT, SMOLENSK REGION. (Riss-vürmskie (mikulinskie) mezhlednikovye otlozheniĭa u d. Rĭasna, Ponizovskogo raĭona, Smolenskoi obl.; Text in Russian). Biulleten' Moskovskogo Obshchestva Ispytatelei Prirody, Otdel Geologicheskii, 32(2):15-23 incl. tables, diagr., March-April 1957. 11 refs. (Eng. transl.: Israel Program for Scientific Translations, p. 166-176, Jerusalem, 1964. Office of Tech. Services, Dept. of Commerce, Wash. 25, D. C., OTS 63-11134/1-3, 1964).

DLC, Q60 M8

A detailed description is given of the Riss-Würm stage. In addition, the southern boundary of the Würm (Kalinin) Glaciation in the Smolensk area is discussed. Pollen distribution diagrams are given and the development phases of forests are discussed. In the list of macrofossils, several thermophilic species are mentioned, of which *Dalichium spathaceum* is of special interest and is the index fossil of the Mikulino glaciation period. (Authors' abstract)

# CRREL BIBLIOGRAPHY

SIP 22902

551.33(\*58)

Sollid, Johan Ludvig  
DEGLACIATION AT THE PRESENT MAIN WATER  
DIVIDE BETWEEN HJERKINN AND KVIKNESKOGEN  
SOUTH NORWAY. (Isavsmeltingsforløpet langs hoved-  
vasskillet mellom Hjerkin og Kvikneskoen; Text in  
Norwegian with English summary). Norsk Geografisk  
Tids. 19(1-2):51-76 incl. illus., maps, 1963-1964.  
41 refs.

DLC, G1.N6

This preliminary report gives some general trends  
of the deglaciation of a central part of Southern Nor-  
way. The central and distal types of deglaciation  
were studied at the main water divide. In the western  
part in the Fokstumyr-Hjerkin areas the northwest-  
ern ice movement from the broad zone of the elongated  
Central-Scandinavian culmination of the inland ice  
surface has been succeeded by a northeastern move-  
ment from a local and late center of glaciation in  
Western Jotunheimen. The latest direction of ice  
movement in the eastern part of the investigated area  
is northwest toward the main water divide. The ice  
in this area was stagnant during the reconstructable  
part of the deglaciation. This suggests that Western  
Jotunheimen was a distinct center of ice accumulation  
at the end of the last glacial stage, while the firn line  
of central Southern Norway was too elevated for the  
ice to be nourished. The Driva valley was blocked  
from the main deglaciation drainage which followed  
more eastern outlets across the present water divide.  
Valley glaciers developed on the distal side of the  
present water divide during late stages of the deglaci-  
ation. In the northern part, the ice surface sloped  
westward both at the proximal and the distal side of  
the present water divide. This can be related to the  
north-south-trending culmination of the ice surface  
east of the Swedish border. Younger Dryas end mor-  
aines are present in Sunndalen 17 km inland from the  
head of the fjord. (Author's abstract, modified)

determined by repeated weighings. Daily snow-evap-  
oration reductions were sizeable (13-90%). Hexadeca-  
nol can be used to enhance the survival of planted  
seedlings at adverse sites and possibly to suppress  
general water loss from snow. --BLE

SIP 22904

551.33(\*440)

Ives, J. D.  
DEGLACIATION AND LAND EMERGENCE IN NORTH-  
EASTERN FOXE BASIN, N.W.T. Geographical Bull.  
No. 21:54-65 incl. maps, May 1964. 15 refs.  
DLC, F1001.G4

Between Longstaff Bluff and Steensby Inlet, western  
Baffin Island, late-glacial marine submergence does  
not exceed 345 ft and decreases northward to 315 ft in  
Steensby Inlet. Five collections of marine molluscs  
between 290 and 30 ft above sea level yielded radio-  
carbon ages ranging from  $6725 \pm 250$  yr to  $2050 \pm 170$   
yr. These ages allow the construction of an uplift  
curve similar to others from different parts of Cana-  
da and Greenland. The 290-ft sample occurred close  
to the marine limit; its age ( $6725 \pm 250$  yr) is a good  
approximation for that of maximum marine submer-  
gence, which is recent compared with that found in  
other parts of Canada. Geomorphological investiga-  
tions revealed glacial outwash associated with mor-  
ainic arcs, which are graded to various levels below  
the marine limit. That the evidence of submergence  
in coastal valleys and inlets is often restricted to  
levels below 200 ft implies the presence of late-gla-  
cial, and possibly "postglacial," glacier ice. Baffin  
Island inland ice, therefore, penetrated a high-level  
Foxe Basin more recently, perhaps much more so,  
than 6725 yr ago. At least 30 ft of land uplift has  
occurred in the last 2000 yr and the uplift is probably  
taking place today. (Author's abstract)

SIP 22903

551.573:551.578.46:551.579.5(237.1)

Anderson, Henry W. and others  
EVAPORATIVE LOSS FROM SOIL, NATIVE VEGE-  
TATION, AND SNOW AS AFFECTED BY HEXADEC-  
ANOL. General Assembly of Berkeley [Aug. 19-31],  
Internatl. Assoc. Scient. Hydrol., Committee for  
Evaporation, No. 62:7-12 incl. tables, 1963. 4 refs.  
DLC, GPRR

The results are reported of a study made during 1961-  
62 of the effect of hexadecanol on summer soil mois-  
ture losses and evaporation from a snow cover during  
winter at high elevations in central Sierra Nevada.  
Only in a bulldozed brush field with heavy applications  
of hexadecanol under snow did significant reductions  
in evapotranspiration occur in natural stands. To  
test the effects of hexadecanol on snow evaporation,  
hexadecanol was applied as an emulsion to snow sur-  
faces in small plastic pans, and evaporation was

SIP 22905

551.501.551.524.36:551.32

Arnold, K. C. and D. K. MacKay  
DIFFERENT METHODS OF CALCULATING MEAN  
DAILY TEMPERATURES, THEIR EFFECTS ON DE-  
GREE-DAY TOTALS IN THE HIGH ARCTIC AND  
THEIR SIGNIFICANCE TO GLACIOLOGY. Geographi-  
cal Bull. No. 21:123-149 incl. tables, graphs, May  
1964. 3 refs.  
DLC, F1001.G4

The number of melting degree days is a useful meas-  
ure of the intensity of an ablation season, and the con-  
cept may be used in relating long-term temperature  
records to observed historical fluctuations of glaciers.  
Based on data collected under marginal freezing and  
thawing conditions, the disparities are examined which  
are caused by different methods of calculating mean  
daily temperatures. It is concluded that in glacio-  
logical studies, a more careful estimate of degree-

# CIREL BIBLIOGRAPHY

day totals is justified, particularly when air temperatures fluctuate across the base from which the totals are calculated. --BLE

SIP 22906

551.322/.326:53

Peschanskiy, I. S.  
ICE SCIENCE AND ICE TECHNIQUE. (Ledovedenie i ledotekhnika; Text in Russian). Leningrad, Izd-vo "Morskoy Transport," 1963. 345 p. incl. illus., tables, graphs, diagrs. 50 refs.  
DLC, GB2403.P4

The following topics are reviewed in the manual which is divided into five chapters. (1) Properties of water and freezing; properties of ice, ice friction, and proposed classification of various types. (2) Ice cover properties depending on the origin of the cover. Conditions for the formation and development of the cover by accretion (thermal origin) or by accumulation (dynamic thickness, elasticity, tension, thermal regime, age and solidity of the ice cover; instruments used for this purpose. (4) Behavior of the ice cover under loads and use of its bearing capacity for motor and railroad traffic with practical examples. (5) Methods of destruction of the ice cover by use of mechanical means such as icebreakers, ice cutting devices and drilling; use of explosives, chemicals or solar radiation; and circulation of underlying warmer water to delay ice formation. Practical illustrated examples of method application are shown. --VDP

SIP 22907

551.34:53

Mazurov, G. P.  
PHYSICAL AND MECHANICAL PROPERTIES OF FROZEN GROUND. (Fiziko-mekhanicheskie svoystva merzlykh gruntov; Text in Russian). Leningrad, Izd-vo literatury po stroitel'stvu, 1964. 165p. incl. illus., tables, graphs, diagrs., map. 52 refs.  
DLC, Slavic unclassified

Terms used in permafrostology are defined. Occurrence, thickness and temperature of permafrost grounds are studied and mapped. The nature of the ground water, its translocation in freezing ground, the composition and structure of frozen ground and use as structural foundations are discussed. Methods for determining the physical, mechanical, and thermal properties of frozen grounds are explained. A calorimetric method and a method using physical constants for determining the ice and water content of the ground are described. Methods and computation formulas for determining the depth and rate of thaw of frozen ground foundations take into account the rigidity and size of the structures. Formulas for the determination of heat necessary for artificial thawing of frozen ground are presented and illustrated by practical examples. (See SIP 20408) --VDP

SIP 22908

551.521.32(\*3)

Gavrilova, M. K.  
THE RADIATION CLIMATE OF THE ARCTIC REGIONS. (Radiatsionnyy klimat Arktiki; Text in Russian). Leningrad, Meteorologicheskoe Izd-vo, 1963. 225 p. incl. tables, graphs, maps, diagrs. 296 refs.  
DLC, QC911.G3

Research on the atmospheric regime of Soviet and foreign Arctic regions is systematized and generalized. Analysis and computation of radiation and radiation balance in the high latitudes are given and are discussed. The distribution of the monthly values of the accumulated radiation has basically a latitude character, the incoming radiation from May-July being 1 kcal/sq cm greater than in moderate latitudes. Cloudiness has an important action in radiation distribution during the clear period of the year. The values of the absorbed radiation decrease with higher latitude. The largest values in the continental Arctic and over open water occur in June (10 to 20 kcal/sq cm), and in the far northern islands and continental areas in July (5 to 9 kcal/sq cm). During the year each sq cm of surface loses through outgoing radiation from 20 (central arctic regions) to 50-60 (open sea) kcal of heat. The yearly totals of the radiation balance are the main components of the heat budget and vary from 10 to 15 kcal/sq cm on the continental polar circle and from 0 to 2 kcal/sq cm in the central polar basin. The heat of the absorbed radiation constitutes up to 40 to 70%, and the outgoing radiation 30 to 50% of the gain and loss, respectively, of the thermal regime of the peripheral Arctic seas. The normal cycle of the areal radiation balance in the Arctic regions is established. The types of radiation regime in the Arctic and Antarctica are compared. Computed values of radiation balance are tabulated in Arctic regions approximately up to 60° lat. --VDP

SIP 22909

551.324:551.4(\*35)

Lewis, Colin A.  
THE GLACIER OF KALDALÓN, NORTH-WEST ICELAND. Geographical J. 130(3):390-396 incl. tables, map, Sept. 1964. 8 refs.  
DLC, G7.R91

Kaldalónsjökull, the glacier of Kaldalón, was investigated during the 1962 summer. It is the main outlet glacier for the southern part of the ice cap of the northwestern peninsula of Iceland. Data was gathered concerning the glacier's snout position, mass balance, temperature, a series of tunnels which ran from the snout into the glacier for over 1/4 mi, and movement. The glacier was in marked retreat which was probably due to the lack of snowfall during recent years. A rock bar was found beneath the ice which will probably emerge as a valley step later. This bar was not plucked or shattered, but pushed apart by the force of the ice above it. The stream emerging from the glacier becomes larger in the afternoon and smaller in the morning. A series of moraines exist below the present glacier snout. --BLE

# CRREL BIBLIOGRAPHY

SIP 22910

551.324.433:551.331(411)

Price, Robert J.  
A GLACIAL MELT-WATER DRAINAGE SYSTEM IN PEEBLESSHIRE, SCOTLAND. *Scot. Geographical Mag.* 79(3):133-141 incl. diags., maps, Dec. 1963. 22 refs.

DLC, G1.S43

Over 570 meltwater channels were observed in Peeblesshire and the pattern that emerged when these channels were mapped presented many problems relating to their mode of origin and the manner of the dissipation of the last ice to occupy the area. Many of the channels are from 20 to 200 yd long and from 10 to 30 ft deep. The larger ones are over 3 mi long, up to 200 yd wide, and up to 100 ft deep. The channels are classified as marginal and submarginal, subglacial, and superimposed. The position, form, and distribution of the channels suggest that they were formed during the downward wastage of an ice sheet that had probably covered most of the hills of the area. Evidence also suggests that, at least at an early stage of the wastage, there was a flow northward and northeastward throughout Peeblesshire that ignored the underlying relief. When large areas of land had emerged above the ice surface, the original meltwater drainage system was modified and the meltwater streams flowed along the sides of, and later on the bottoms of the main valleys. Most of the fluvio-glacial deposition occurred during this second phase. --BLE

SIP 22911

551.33(411)

McCann, S. B.  
THE LATE-GLACIAL RAISED BEACHES AND RE-ADVANCE MORAINES OF THE LOCH CARRON AREA ROSS-SHIRE, SCOT. *Geographical Mag.* 79(3):164-169 incl. maps, Dec. 1963. 10 refs.

DLC, G1.S43

Previous investigations in this area of Scotland are discussed and the deposits are described at the entrance and at the head of Loch Carron. The sequence of events indicated by the raised beach and related Late-glacial deposits consist of (1) a period of maximum sea-level, 85-95 ft above the present level, when a glacier extended down the site of the loch to the narrows at Strone Ferry with the outwash material being deposited into the sea and reworked as beach material; (2) a period of falling sea-level with a contemporaneous retreat of the glacier up the site of the loch and for several miles up Strath Carron, during which the gravel terrace 53 ft above H.W.M. (the high water mark of ordinary spring tides) at Strone Ferry and the large area of the 30-50 ft beach at the head of the loch were deposited; and (3) a re-advance of the glaciers down Strath Carron and the tributary glen at Tullich, after the sea had fallen below the 50-ft level. This is marked by the great terminal moraines in Strath Carron and the similar feature at the head of Loch Torridon to the north. The only positive evidence of Late-glacial re-advance in the area between Loch Carron and Loch Torridon is two prominent moraines. --BLE

SIP 22912

551.332.24(\*57)

Bergdahl, Arvid  
GLACIFLUVIAL [sic] ESTUARIES ON THE NÄRKE PLAIN. III. THE ICE MARGIN IN THE AREA OF NORRBYÅS. *Svensk Geografisk Årsbok*, 39:154-161 incl. illus., diagr., maps, 1963.

DLC, G25.S8

The Kvismar Valley in the southeastern part of the subaquatic Närke Plain is crossed by the Pälisboda esker in a north-southerly direction between the two small lakes of Western and Eastern Kvismaren. The melt river of the esker has formed an estuary at its mouth in the ice margin, the eastern side of which is marked by moraine ridges in this basin. The moraine ridges are exposed on moraine areas risen out of the sediment, mainly drumlins. On the west side of the esker, there are no ridges on the low plain south of W. Kvismaren. The rock ground belongs to the Archaean and is exposed in very few localities. In two cases, striae can be observed. A detailed description is given of the moraine ridges, the crevasses and inlets in the ice cliff, and deglaciation of the northwestern part of the area. --BLE

SIP 22913

551.345.3:551.343.2(\*57)

Johnsson, Gunnar  
PERIGLACIAL ICE-WEDGE POLYGONS AT HÄSLEHOLM, SOUTHERNMOST SWEDEN. *Svensk Geografisk Årsbok*, 39:173-176 incl. illus., diagr., 1963. 5 refs.

DLC, G25.S8

The polygonal pattern is described which was found in a gravel pit in 1958 near the road between Stoby and Hässleholm in Scania, Sweden's southernmost province. Finds of similar polygons in other countries are mentioned. The tundra polygons found at Hässleholm have a tetragonal form, generally measuring 35-65 m. The points where the ice-wedges intersect are often irregular. Another characteristic of the polygons is the occurrence of many small cracks radiating from the bigger ones. Vertical sections of the ice wedges can be studied on the walls of the gravel pit. The maximum breadth of an ice wedge in a horizontal section found immediately below the cultivated soil is over 1 m. The old frost cracks were unusually deep. The normal breadth of the dug-out wedges is 8-10 cm. --BLE

SIP 22914

551.321.5(\*429)

Mathews, W. H. and J. R. Mackay  
SNOWCREEP STUDIES, MOUNT SEYMOUR, B.C.: PRELIMINARY FIELD INVESTIGATIONS. *Geographical Bull.* No. 20:58-75 incl. tables, graphs, diags., map, Nov. 1963.

DLC, F1001.G4

# CRREL BIBLIOGRAPHY

The instrumentation is discussed which was developed for snow-creep measurement during the period 1958-62. Movement direction of the snowpack was determined by inserting 2.5-mm-wide metal ribbons in the ground or in cracks in bedrock. The ribbons become permanently flexed with a bending moment of 75 gm/cm. The rate of movement and total movement of basal snowpack layers was measured most consistently by using 3- and 4-in.-diam. wooden spheres placed on the ground and tethered loosely by means of single-strand Monel wire to slender steel poles inserted upslope. During the 1962-63 winter, the wire was connected upslope to a continuous recorder capable of monitoring displacement as small as 0.5 mm within a 15-min interval. Pressure exerted by the creeping snow against stationary objects was measured hydraulically with transducers consisting of a square plate mounted at the upslope end of a piston which bears against a flexible brass bellows. Observational data are discussed and presented year by year. Displacements of from 2 to 3.5 ft occur in a single winter within the bottom 3 to 6 in. of snowpack on steeper slopes. The pressure of the downslope component of load is sufficient to push loose stones down inclines. Also, the loads and amount of movement are adequate to account for the deformation of trees on the nearby timbered slope. --BLE

SIP 22915

551.332.53(\*462)

Andrews, J. T.  
THE CROSS-VALLEY MORAINES OF NORTH-CENTRAL BAFFIN ISLAND: A QUANTITATIVE ANALYSIS. Geographical Bull. No. 20:82-129 incl. illus., tables, graphs, diags., map, Nov. 1963. 38 refs.  
DLC, F1001.G4

This paper presents and reviews the quantitative data collected during 1961 and re-examines the five hypothesis of origin which have been proposed for these glacial forms. Emphasis is placed on the sampling and statistical measurement of sediments, exposures from the valley sides, till samples from river-cut exposures, stratigraphy and sedimentary characteristics of the central kames, till-fabric analysis, and the spacing of the cross-valley moraines. Field technique is described in each instance, and theories of origin of the moraines are related to theories from other studies. It is concluded that the moraines are formed by the squeezing of water-soaked ground moraine into basal crevasses behind a proglacial lake. --BLE

SIP 22916

551.336:551.79(\*57)

Norrman, John O.  
LAKE VÄTTERN. INVESTIGATIONS ON SHORE AND BOTTOM MORPHOLOGY. QUATERNARY GEOLOGY. Geografiska Annaler, 46(1-2):29-41 incl. illus., graph, map, 1964.  
DLC, G25.G4

This chapter presents a brief outline of the late-Quaternary development of the Lake Vättern basin, which is based on the works of E. Nilsson and Granlund and the conclusions of G. Lundqvist. It is divided into 2 parts: ice recession; and land uplift and water levels. The azimuthal distribution of the glacial striae indicates a terminal ice movement in a southerly direction. When the southernmost part of the ice was still just south of Jönköping, the ice had already melted from the highest parts of the Hökensås hills up to about the latitude of the northern end of Visingsö Island. During the next recession, lower passes were successively exposed in the eastern and western borders. In the period from about 8900 to 8100 B.C., the recession was slow and there was some advance. In the year 8223 B.C., the Baltic Ice Lake was lowered to the level of the sea by an outflow through the Örlen valley southwest of Karlsborg. At the early stage of the Yoldia Sea, the ice margin was well north of Motala Bay and just south of Stora Höken Island. Also discussed are the deposits of the central and southern section, Motala Bay, and the northern section. --BLE

SIP 22917

551.48:551.326.85(\*57)

Norrman, John O.  
LAKE VÄTTERN. INVESTIGATIONS ON SHORE AND BOTTOM MORPHOLOGY. HYDROLOGY. Geografiska Annaler, 46(1-2):53-69 incl. illus., tables, graphs, diags., 1964.  
DLC, G25.G4

This chapter discusses discharge and runoff, water stage, thermal conditions, and waves in Lake Vättern. The lake is only occasionally frozen over from shore to shore during the winter (about once in 10 yr). The ice conditions are graphed for the period 1880/81-1960/61. Late freezing and break-up are typical. When the drift is hard, broken ice is driven ashore, and the pieces are piled up in ice walls. With time, larger fields of broken ice freeze, and when the lake is frozen over, the cover exhibits a mosaic pattern of ice floes. Thermal contraction and extension of the ice cover cause large cracks, generally running diagonally across the lake. For a total ice cover, ice thickness ranges from 0.2-0.6 m. In the spring, the ice is fretted by sunshine and rain and then becomes porous with a vertical pipiness. Although still thick, its strength is reduced considerably. --BLE

SIP 22918

624.145:551.326.6(\*62)

Van Allen, W. H.  
INTERNATIONAL ICE PATROL. Can. Geographical J. 62(3):76-87 incl. illus., diagr., maps, March 1961.  
DLC, G1.C3

This paper discusses ice conditions in the North Atlantic and Canadian waters in 1959 and 1960, the history of the International Ice Patrol which came into



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being after the sinking of the Titanic in 1912), the origin of icebergs, collisions with icebergs, ice patrol operations, ocean currents (the main factors which affect the movements of icebergs and growlers), the oceanographic program of the International Ice Patrol (which includes the prediction of iceberg drift and deterioration and the study of the physical properties of icebergs), and experiments to destroy icebergs by gunfire and high explosives. --BLE

SIP 22919

551.32:91(091)(\*464.2)

Lotz, J. R.  
OPERATION HAZEN. THE FIRST SUMMER, AND THE WINTER PARTY. Can. Geographical J. 63(2): 41-51 incl. illus., map, Aug. 1961.  
DLC, G1.C3

This paper discusses the organization, logistics, scope, and accomplishments of the expedition to the Lake Hazen area in Northern Ellesmere Island, which began in the summer of 1957. The scientific investigations included glaciology, meteorology, zoology, botany, geomorphology, and archaeology. --BLE

SIP 22920

551.32:91(091)(\*464.2)

Lotz, J. R.  
OPERATION HAZEN. - THE SECOND SUMMER. Can. Geographical J. 63(3):101-111 incl. illus., map, Sept. 1961.  
DLC, G1.C3

The activities of the third phase of Operation Hazen are discussed which included digging out tents and equipment which were left over the winter, the establishment of gravity stations, ablation movement, and accumulation studies on the Gilman Glacier, numerous journeys out of the glacier camp to collect data (geological, geomorphological, botanical, and archeological), the observation of herds of large animals grazing on the Arctic tundra, and the study of the Arctic char (the only species of fish living in Lake Hazen). The material gathered permits the disposal of the theory that Lake Hazen had been a migration route, or the site of an extensive population in the past. --BLE

SIP 22921

624.131:551.345

Broms, Bengt B. and Leslie Y. C. Yao  
SHEAR STRENGTH OF A SOIL AFTER FREEZING AND THAWING. Proc. Amer. Soc. Civil Engrs. J. Soil Mechanics and Foundations Div. 90(SM4):1-25 incl. tables, graphs, diagr., appendix, July 1964, Pt. 1. 16 refs.  
DLC, TA710.A495

The shearing strength and deformation characteris-

tics of a silty clay that has been subjected to freezing and thawing has been investigated. The soil was compacted in a rigid steel cylinder at the optimum moisture content to its standard Proctor maximum dry density. The soil was frozen under open or closed drainage conditions at freezing rates of 3.0 or 0.5 in/day and at a surcharge load corresponding to 6.0 or 24.0 in. of soil. After coring, the frozen soil was allowed to thaw in a triaxial cell under drained or undrained conditions at a confining pressure of 21, 33, 7.11, or 1.78 psi. Then the thawed soil specimens were tested to failure under undrained conditions. (Author's abstract)

SIP 22922

551.336:551.79(\*49)

Porter, Stephen C.  
LATE PLEISTOCENE GLACIAL CHRONOLOGY OF NORTH-CENTRAL BROOKS RANGE, ALASKA. Amer. J. Sci. 262(4):446-460 incl. tables, diagrs., maps, April 1964. 23 refs.  
DLC, Q1.A5

End moraines and exposed stratigraphic sections of glacial sediments along the Anaktuvuk and Chandler Rivers represent 4 substages of the late Pleistocene Kiklik glaciation in the northcentral Brooks Range, Alaska. Ice of the maximum advance, the Banded Mountain, flowed north along the Anaktuvuk Valley from an ice divide south of the present stream-drainage divide and formed a broad piedmont lobe extending 23 mi north of the mountain front. Two subsequent readvances, the Anayaknaurak and Antler Valley, left morainal borders 4 and 7 mi, respectively, behind the moraine of the maximum advance. Ice of the still later Anvik Lake readvance built a moraine 6 mi north of the drainage divide at Anaktuvuk Pass. Radiocarbon dates indicate that the Anayaknaurak readvance occurred soon after 13,270 ± 160 yr B.P. The Kiklik glaciation is correlated broadly with the classical Wisconsin glaciation of central North America; its 4 substages are provisionally correlated with 4 substages (Tazewell, Port Huron, Valdres, and Cochrane) of the classical Wisconsin. Moraines in tributary valleys record 3 post-Kiklik advances that were restricted to the highest parts of the range. The Alapah Mountain advance, radiocarbon-dated at 2830 ± 120 yr B.P., and the Fan Mountain I and II advances were post-Hypsithermal events that appear comparable to correlative advances noted elsewhere in the North American Cordillera. (Author's abstract)

SIP 22923

551.326.03

Bilello, Michael A.  
METHOD FOR PREDICTING RIVER AND LAKE ICE FORMATION. J. Applied Meteorol. 3(1):38-44 incl. tables, graphs, map, Feb. 1964. 5 refs.  
DLC, QC851.A66

Two sets of curves are developed which can be used

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to forecast the dates of: 1) first appearance of ice in the fall; and 2) ice formation from shore to shore on the Mackenzie River at Fort Good Hope, Canada. Similar curves, based on the same method, can be derived for sheltered harbor, lake, and river locations. The numerical constants necessary to develop these curves were obtained from a relationship between mean daily air temperatures and previously observed dates of ice formation. To apply the curves, an adjusted temperature record, based on a numerical constant (N) and daily air temperatures, is maintained starting in early summer. Subsequently, this daily-adjusted temperature is applied to the family of curves to provide a day-to-day forecast of the date of ice formation. (Author's abstract)

distribution. Relatively strong association was found between the hail distribution and the combination of these five climatological elements, when multiple correlation analysis was performed and regression equations developed. The results of the study indicate that in a region of minor topographic influences, such as in Illinois, the hail distribution can be explained largely by relating it to the multiple effects of other climatic events, whose distributions are determined by atmospheric conditions which are related to hail development. The Illinois study suggests that the frontal distribution pattern strongly influences the location of centers of maximum hail frequency. (Author's abstract)

SIP 22924

551.509.67(52)

Takeda, K.  
AN EVIDENCE OF EFFECTS OF DRY-ICE SEEDING ON ARTIFICIAL PRECIPITATION. J. Applied Meteorol. 3(1):111 incl. illus., Feb. 1964.  
DLC, QC851.A66

Conclusive results were obtained in individual seeding trials by seeding a cloud system from an aircraft in a pattern distinct from any naturally occurring one and looking for a corresponding pattern in the precipitation. Six seeding trials were conducted on March 11, 1963, at Hitoyoshi, Kyushu, Japan. Dry ice pellets about 1 cm<sup>3</sup> were dropped in a race track pattern from 4.6 km at -8° C and a rate of about 1 kg/km. The aircraft, a P2V Neptune, experienced severe icing in the clouds. The 0° C level was at 2.6 km and just a trace of rain was falling fairly uniformly over the area. In each case, a precipitation pattern corresponding to the wind-distorted seeding pattern was observed to form between 20 and 30 min later at a position downstream from the seeded area. The data are being analyzed and the precipitation rates associated with the pattern will be measured with the computer which is an integral part of the radar with which these observations were made. --BLE

SIP 22925

551.578.72:551.58(77)

Huff, F. A.  
CORRELATION BETWEEN SUMMER HAIL PATTERNS IN ILLINOIS AND ASSOCIATED CLIMATOLOGICAL EVENTS. J. Applied Meteorol. 3(3):240-246 incl. tables, maps, June 1964.  
DLC, QC851.A66

Correlation and regression analyses were employed to evaluate the relation between summer hail patterns in Illinois and the climatological distribution of other meteorological elements, after dividing the state into sections with similar climatological characteristics. The distributions of thunderstorms, rainfall, maximum air temperature, dew-point temperature, and synoptic weather fronts were related to the hail

SIP 22926

624.143.3:621.396.67

Langer, G. and others  
SUPPRESSION AND REMOVAL OF STRUCTURAL ICE. J. Applied Meteorol. 3(3):316-322 incl. illus., graphs, diagr., June 1964. 13 refs.  
DLC, QC851.A66

Possible techniques for suppressing or removing ice from large radar antennas located in the Arctic were investigated. Of immediate concern are the original Ballistic Missile Early Warning System antennas, which are too large to enclose in radomes. The icing rates of various parts of the antennas and of the antennas as a whole were determined. Ice suppression by nucleation and deflection was studied and mechanical removal was evaluated. (Author's abstract)

SIP 22927

551.578.4(52)

Sekiguti, T. and M. Yoshimura  
GEOGRAPHICAL DISTRIBUTION PATTERNS OF DAILY SNOWFALLS IN HOKURIKU (JAPAN SEA SIDE) AREA. (Hokuriku chihō no shinsekisetsu bunpu; Text in Japanese). Seppyō, 25(3):1-5 incl. graphs, maps, May 1963.  
DLC, Orientalia Div.

The Japan Sea Side area is the snowiest region in the world. Geographical distribution maps of daily snowfall and the occurrence of excess snowfall (mean snowfall + 2 standard deviation) have been drawn for 98 days during the two winters of 1955-1957. Four typical snow types were distinguished and related to respective synoptic charts and upper-air conditions: 1) scattered mountain snow, 2) mountain snow, 3) coastal snow, and 4) heavy snowfall. The scattered mountain snow is most predominant and occurs in 30% of the snow days. The mountain snow covers more extensive areas than the scattered type and is observed when the upper-air is colder than -18° C. The coastal snow falls in daily amounts of 20-40 cm, occurring when the Japan Sea gradient is not steep and the wind is weak. The heavy snowfall reaches more than 100 cm often and occurs in the mountains and on the coast. (Author's abstract, modified)

SIP 22928

551.578.46:537.226(52)

Sakurai, K. and C. Magono  
ON THE ELECTRIC CHARGE ON BLOWING SNOW PARTICLES. (Hisetsu no denka ni tsuite; Text in Japanese). Seppyo, 25(3):6-11 incl. illus., tables, graphs, diagrs., May 1963. 3 refs.  
DLC, Orientalia Div.

Vertical profiles of electrical potential near the surface were measured during blowing snow in 3 winters from 1959 to 1961 at the top of Mt. Teine near Sapporo, Hokkaido. In the measurements, a Pb 210-plated ion-collector was placed at 300, 100, 65 and 10 cm above snow surface and connected to a foil detector biased with  $\pm 135$  to  $\pm 225$  volts to increase sensitivity. The results indicated a positively charged layer of large snow particles 1 m from the surface and a negatively charged layer above that. This helps to explain the disagreement of results obtained hitherto by Simpson, Yoshida and Ota. Dependence of the potential distribution on time variation and wind velocity was studied. --CST

SIP 22929

629.113:551.578.46

Shimoda, S.  
CAR DRIVING ON SNOW ROADS. (Sekisetsu romen ni okeru jidōsha sōkō; Text in Japanese). Seppyo, 25(3):15-22 incl. graphs, diagrs., May 1963.  
DLC, Orientalia Div.

Automobile traction on roads with a snow accumulation under 30 cm was studied. In straight forward driving, tire rotating resistance increased 10 to 30 times while cohesive force on the driving wheel decreased 1/4. A 16 mm movie camera was used to determine the vehicle (with clutch in neutral) resistance as time-velocity variation. The friction coefficient was found to be 0.03 to 0.15 for a snow depth of 0-30 cm and a density of 0.11 to 0.16. The brake test was made by measuring the initial velocity and total distance travelled on snow 2-18 cm deep. The motion, moment, and centrifugal force exerted on a side-slipping tire are discussed in connection with steering. With a load under 100 kg, the centrifugal force coefficient is 0.6 on concrete roads and 0.2 to 0.4 on snow roads. --CST

SIP 22930

551.578.48:624.182(52)

Takano, H.  
SNOW AND LANDSLIDES. (Yuki to chisuteri; Text in Japanese). Seppyo, 25(3):23-25, May 1963.  
DLC, Orientalia Div.

No unique correlation has been established between the number of occurrences of landslides and snow accumulation and thawing. According to statistics gathered over the last 10 yr, landslides occurred most frequently during the thawing of the first snow;

30% occurred in Nov-Dec., 40% in March-April, while only 10% occurred during June, July, and Aug. In the thaw period, warning is necessary when temperatures higher than 6°C persist for several days during which thaw water corresponds to 40 mm rainfall. Since a large landslide usually consists of many small blocks 40 to 50 m in length and 30 m in width, early detection of small block sliding is important. Countermeasures discussed include consideration of water discharge, concrete walls, removal of sliding blocks, and the prevention of underground-water permeation. --CST

SIP 22931

551.345.3

Pchelintsev, A. M.  
STRUCTURE, PHYSICAL AND MECHANICAL PROPERTIES OF FROZEN GROUND. (Stroenie i fiziko-mekhanicheskie svoystva merzlykh gruntov; Text in Russian). Moscow, Izd-vo Nauka, 1964, 260p. incl. illus., tables, graphs, diagrs. 172 refs.  
DLC, Slavic unclassified

The first two chapters discuss the crystallization of water frozen in dispersed rocks. In Chapters III, IV and V, the formation of inclusions, mineral layers, and ice cement are studied. Chapters VI, VII and VIII describe the textures for various frozen rock masses and classify the fundamental types. In Chapters IX to XIII, the effect of texture of frozen rocks in respect to ice content and moisture, weight by volume, and sag when thawing is discussed. The relationship between the cryogenic structure of the rocks and their heaving, when freezing, is also studied. New methods to determine frozen ground properties from an evaluation of data characterizing the cryogenic texture are described. A method for controlling the heaving of foundations and underground utilities (cables, pipelines, etc.) is proposed. The basic experimental observations were carried out at the Igarka Scientific Research Frost Station of the Obukhov Frost Institute of the Academy of Sciences of the USSR. -- VDP

SIP 22932

551.345:539.42

Pekarskaya, N. K.  
SHEAR STRENGTH OF FROZEN GROUND AND ITS DEPENDENCE ON TEXTURE. Prochnost' merzlykh gruntov pri raznykh usloviyakh zavisimost' ot tekstury; Text in Russian). Moscow, Izd-vo Akad. nauk SSSR, 1963, 107p. incl. illus., tables, graphs, diagrs. 90 refs.  
DLC, TA713.P4

Frozen ground is a complicated anisotropic body whose strength depends on the arrangement of its components and the direction of the shearing force. The role of the coefficients of friction and cohesion in the shear-strength of frozen ground and dependence on composition, structure, texture, temperature, and duration of the displacing action are explained. The

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method and the instruments used for shear-strength measurements are described. The influence of the variation of the temperature below the freezing point on the strength properties of the ground depends not only on the change of phase of the water contained in the frozen ground but also on the strength of the ice crystal lattice. The influence of texture on ground strength under rapid increase of force or prolonged action is studied. The plastic flow of frozen ground is determined by texture and ice content. Laboratory tests are described, and rheological curves of the behavior of frozen grounds (clay or solid or laminated texture) and ice are presented and compared. -- VDP

SIP 22933 631.3.004.4:546.21:536.48

Ross, D. J.  
EFFECTS OF LOW-TEMPERATURE STORAGE ON THE OXYGEN UPTAKE OF SOIL. *Nature*, 204(4957): 503-504 incl. tables, Oct. 31, 1964. 8 refs.  
DLC, Q1.N2

An experiment is described to determine the effects of low-temperature storage on the respiratory activity in 4 soils derived from different parent materials. Some properties of the soils and the oxygen uptake of fresh and frozen soil samples are tabulated. The results indicate that freezing did not change the activity of these soils in any consistent way. It is suggested that storage at low temperatures may be suitable for maintaining the respiratory activity of other soils. However, the effects of freezing on each biochemical activity must be determined separately in order to assess the value of storing soils at low temperatures. -- BLE

SIP 22934 551.324.6(\*32)

Kosiba, Aleksander  
CHANGES IN THE WERENSKIOLD GLACIER AND HANS GLACIER IN SW SPITSBERGEN. *Bull. Intern. Assoc. Sci. Hydrol.* 8(1):24-35 incl. tables, graphs, April 1963.  
DLC, GPRR

This region lies within the zone of influence of the anticyclonic pattern of the sea-ice region of the Arctic Ocean and the cyclonic patterns of the Barents Sea, or of the Icelandic region, the frequency of cyclonic patterns being predominant. Owing to hydroclimatic and orographic differences (Werenskiold Glacier terminates on land only 1.4 km from the bay and 20-30 m above sea level; Hans Glacier is a transition land-fiord type), the glaciers vary considerably as their fronts and thicknesses change. The changes in the glaciers (thickness, snout position, surface movement, altitude and volume of the tongue, etc.,) are tabulated and graphed primarily from data collected during the Polish I.G.Y. and I.G.C. Expeditions in 1957-1960. The intensive ablation in the

lower parts of the glaciers, which occurred during the last warm period (about 1850-1940), has strongly reduced in the last few years. In the upper firn areas, there has been an increase of accumulation which, in the more active Hans Glacier, resulted in an advance of the front. The ablation also shows large variations from year to year associated with the considerable variations of climatic conditions, especially the actinimetric and wind variations. Maps have been made of the glaciers. -- BLE

SIP 22935

551.324.433(\*7)

Zotikov, I. A.  
BOTTOM MELTING IN THE CENTRAL ZONE OF THE ICE SHIELD ON THE ANTARCTIC CONTINENT AND ITS INFLUENCE UPON THE PRESENT BALANCE OF THE ICE MASS. *Bull. Intern. Assoc. Sci. Hydrol.* 8(1):36-44 incl. graphs, map, April 1963. 11 refs.  
DLC, GPRR

An analysis of the present balance of the ice mass on the Antarctic continent carried out by several authors shows a substantial excess of supply over expenditure. However, no consideration was given to the possibility of a decrease in the amount of Antarctic ice by melting at its lower surface and a runoff of water. This paper is intended to fill this gap. Theoretical analysis shows that the possibility of such melting exists for a definite relationship between the ice thickness, the temperature at its surface, the rate of accumulation and the geothermal heat flow. Using numerical values for these factors, it is shown that throughout the entire central zone of the Antarctic ice cap, over an area of about  $12 \times 10^6 \text{ km}^2$ , there is continuous melting at the bed. Contours of the rates of bottom melting are given on a map of the continent. The maximum rate of melting is about 6-7 mm of water per year. The average rate of melting is about 3 mm of water per year, equivalent to a volume not exceeding  $20 \text{ km}^3$  of water per year, and not more than several percent of the total ice balance of the continent. (Author's abstract)

SIP 22936

551.324.6(\*7)

Shumskiy, P. A.  
ON THE THEORY OF GLACIER VARIATIONS. *Bull. Intern. Assoc. Sci. Hydrol.* 8(1):45-56 incl. graphs, April 1963. 7 refs.  
DLC, GPRR

A glacier remains in a steady state only when a strict relation exists between the rate of external mass exchange, the ice velocity and the thickness at every point. The shape of the glacier and its velocity distribution is determined by a system of equations which take into account the distribution of the external mass exchange, the temperature, form, and properties of the bed. From the equation of continuity of an

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unsteady glacier, the equation of flow, and the rheological equation for ice, a set of equations for the unsteady state of a glacier is deduced. From these equations, it follows that the whole glacier reacts to changes in any part, including its snout. The equations are a set of linear differential equations of the second order and can be solved by numerical and other approximate methods. By applying these methods to the retreating ice cap on Drygalski Island, Antarctica, it was possible to determine time derivatives of the velocity, thickness and position of the ice cap edge, the size of the ice cap, and the velocity distribution in the steady state. The causes for the observed changes can be deduced from the equations by calculating the distribution of the changes in the rate of external mass exchange and ice temperature along the length of a glacier. During the warming and moistening of the Antarctic climate, an increase of ice temperature causes a decrease in thickness of the Antarctic Ice Cap in spite of an increase in precipitation. With simultaneous changes of climate, the glacial epochs of the Antarctic and continents of the Northern Hemisphere cannot be metachronous. (Author's abstract, modified)

SIP 22937

551.324(235.2)

Regensburger, K.  
COMPARATIVE MEASUREMENTS ON THE FEDTS-  
CHENKO GLACIER. Bull. Intern. Assoc. Sci.  
Hydrol. 8(1):57-61 incl. illus., graphs, map, April  
1963. 3 refs.  
DLC, GPRR

The most important results are given of comparative measurements made in 1958 on the Fedchenko Glacier in the northwest part of the Pamirs. The glacier was mapped from the snout to as far as the region south of Tanimas Pass on a scale of 1:50,000. The velocity of the glacier was measured at 7 profiles, 4 of them crossing the glacier and 3 in the region of Tanimas. A comparison of Finsterwalder's map and the new map shows differences only in the lower 30 km of the glacier. The snout receded about 400 m and an area of 1.66 km<sup>2</sup> has become icefree in 30 yr. Comparative data, e.g. surface lowering, loss of ice volume, and surface velocity distribution are mapped and graphed. The velocity of the lower Fedchenko Glacier was 20 and 31 cm/day, measured photogrammetrically. These values correspond well with Finsterwalder's measurements in 1928. In the region of the Tanimas Pass the ice flows down to the east at a velocity of 8 cm/day. -- BLE

SIP 22938

551.324:551.336:551.79(\*38)

Weldick, A.  
GLACIAL VARIATIONS IN WEST GREENLAND IN  
POSTGLACIAL TIME. Bull. Intern. Assoc. Sci.  
Hydrol. 8(1):75-82 incl. map, April 1963. 15 refs.  
DLC, GPRR

A brief survey is made of the variations of the W. Greenland glaciers in postglacial prehistoric and historic time. A list is included which shows the glacier variations in the Julianehab, Frederikshab, Godthab, Sukkertoppen, Egedesminde, Umanak, and Upernavik districts, on the inland ice margin of Disko Bay and on Disko Island. It is tentatively concluded that in postglacial prehistoric time the variations were greater than in historic time, but varied in a uniform way parallel to the present ice margin. In historic time it appears that an advance commenced between 1500 and 1600, and an advance occurred in the 18th century. It is difficult to generalize about the maximum advances. There is a clear tendency for the maxima to occur before 1850 in the South, but in other localities the maxima did not occur until 1900-1930. (Author's abstract, modified)

SIP 22939

551.324.003.1(234.3)

Lanser, Otto  
THE ROLE OF THE GLACIERS IN THE ECONOMY  
AND TECHNICAL DEVELOPMENT OF ALPINE  
COUNTRIES. (Die technische und wirtschaftliche  
Bedeutung der Gletscher; Text in German with Eng-  
lish summary). Bull. Intern. Assoc. Sci. Hydrol.  
8(1):83-93 incl. tables, April 1963. 7 refs.  
DLC, GPRR

In former times the inhabitants of alpine regions looked upon glaciers as an uncanny and dangerous realm to be avoided as much as possible. It is now known that glaciers are responsible for the characteristics of the regime of alpine rivers and of great importance for the economy and technical development of countries. Torrents which are fed by the melted ice carry great quantities of water during periods when other streams run dry. The additional water supply produced by glaciers in summer has a definite effect on the large rivers rising in the Alps and flowing down in all directions and is of special importance for hydraulic economy. Reservoir dams have been constructed to protect valleys from floods caused by glacial lakes. Reservoirs for power plants in the Alps, which are created by the construction of large dams, require the existence of basins hollowed out by former glaciers. An interesting example of the application of modern methods of this type is the collection of the runoff from beneath the Brandner Ferner in the Silvretta from where it is conveyed to the Lünensee. As a water intake on the surface was impossible due to the difficult terrain, a tunnel had to be driven through the rock bed of the glacier. The water flows through the tunnel into a cage which consists of strong steel girders. This cage retains the large boulders while the water from the bottom of the glacier runs off into the tunnel. (Author's abstract, modified)

# CRRLE BIBLIOGRAPHY

SIP 22940

551.324.001.5(436)

Schatz, H.  
OBSERVATIONS ON THE HINTEREIS AND VERNAGT-  
FERNER. Bull. Intern. Assoc. Sci. Hydrol. 8(1):  
94-96 incl. graph, tables, April 1963.  
DLC, GPRR

Investigations and observations which began almost 80 yr ago on the Vernagtferner and Hinterseiferner are reviewed briefly. The Vernagtferner gained great interest through its rapid advances into the Rofental and particularly because of numerous outbreaks of the glacial lakes on which reports date back as far as 1600. Finsterwalder was the first to use photogrammetric methods in high mountains when in 1889 he collaborated to produce a map to the scale of 1:10,000 of the Vernagtferner. During the years 1889 to 1909, Blümcke and Hess made deep borings on the Hinterseiferner for the first time and reached depths of 224 m. Some of the drilling rods were left in the boreholes and later gave valuable information about the movement and conditions in the interior of the glacier. With precise maps and the close network of geodetic reference points, the coordinates of other points were quickly determined. A research program in glacial meteorology has been conducted by Hoinkes and Ambach since 1950. Since 1931, Schatz and Vietoris have continued to make the annual observations and standard measurements on these glaciers which were begun by Hess. Results for the period of 1949 to 1962 are given of transverse profiles of stone lines because these results are of value in determining the mass budget of the Hinterseiferner. It is pointed out that the snout of the Hinterseiferner has retreated 1300 m horizontally since 1920, and that the results of repeated photogrammetric surveys form useful documents on the state of the glacier. -- BLE

SIP 22941

551.324(436)

Slupetzky, Werner and Heinz Slupetzky  
VARIATIONS OF THE SONNBlick, ODENWINKEL  
AND LOWER RIFFEL GLACIERS DURING 1960-1962.  
(Die Veränderungen des Sonnblick-, Odenwinkel und  
Unteren Riffelkeeses in den Jahren 1960-1962; Text  
in German with English summary). Wetter u. Leben,  
15(3/4):60-72 incl. illus., tables, map, 1963. 7 refs.  
DLC, QH543.W4

Glaciological studies were started in 1960 in the Gratspitzgruppe and the western part of the Glocknergruppe. The variations of the Sonnblick-, Odenwinkel- and Unteren Riffelkeeses are described. With the exception of the Sonnblickees being in equilibrium in 1961 and advancing a few meters at some markings, these Austrian glaciers retreated in 1960-61 and 1961-62. The mass balance of the large old snow fields on Sonnblickees survived the ablation seasons of both years. The mass balance of the Sonnblickees seems to have been positive in 1960-61; it was slightly negative in the following year. The debris cover of the Odenwinkel- and Unteren Riffelkeeses (both glaciers have special orographical conditions) is due to the relatively small ablation loss. (From authors' summary)

SIP 22942

582.26:536.48(-7:775)

Holm-Hansen, Osmund  
VIABILITY OF BLUE-GREEN ALGAE AFTER  
FREEZING. Physiol. Plant. 16(3):530-540 incl.  
tables, graph, 1963. 20 refs.  
DLC, QK1.P575

A variety of blue-green and green algae, isolated from Wisconsin and from Antarctica, were tested for ability to survive freezing at different temperatures and also to survive repeated freezing and thawing. The rate of freezing which allowed the greatest survival varied from species to species, but in general a slow rate of freezing resulted in a higher rate of viability than did a rapid rate of freezing. The blue-green algae which showed the greatest survival were filamentous species which normally grow in soil or attached to a substratum in freshwater habitats; the unicellular and planktonic species were killed easily by freezing. With the exception of *Chlorella pyrenoidosa*, the green algae from Wisconsin showed little or no survival after freezing. The progressive loss in viability of *Chlorella* was also determined during continuous storage at -25°C. No viable cells could be detected after one year of storage. (Author's abstract)

SIP 22943

551.33(235.2)

Reiman, V.M. and L.F. Sidorov  
OLD GLACIATION IN THE SOUTHEASTERN PAMIRS.  
(O Drevnem oledeneniĭ Ĭugo-Vostochnogo Pamira;  
Text in Russian). Doklady, Akad. Nauk SSSR, 147  
(2):452-453, 1962. 8 refs.  
DLC, AS232.S3663

The past maximum semiglaciation observed by the authors is indicated by traces of glacial activity near the divides of mountain ranges and by the absence of relics of the peneplain. The features of the Aksu valley and of Mt. Aksai (45° N; 79° E) are described. It is concluded that a peneplain was formed on the southwestern Pamirs during the Mesozoic era. Individual relatively low mountain ranges show traces of grooving from the foot to the divide. The glaciers imparted horn shapes to many of the peaks. Remnants of the peneplain were destroyed by grooving processes. -- Meteorol. and Geostrophys. Abstracts, modified.

SIP 22944

551.33(+531.3)

Vesnin, V. V., V. I. Viira and I. P. Kartashov  
HISTORY OF FORMATION OF GLACIAL RELIEF IN  
THE REGION OF JACK LONDON LAKE. (Istorĭa  
formirovaniĭa lednikovogo rel'efa v raione ozera  
Dzheka Londona; Text in Russian). Doklady, Akad.  
Nauk SSSR, 147(3):667-670 incl. map, 1962. 5 refs.  
DLC, AS262.S3663

# CRREL BIBLIOGRAPHY

In the course of the geological prospecting in the summer of 1960, it was found that none of the published maps can fully explain all the peculiarities of the relief of this lake, located in the basin of the upper Kolyma River (64° N, 156° E). Therefore, a new geological-geomorphological map was developed which is described and illustrated. It is concluded that the principal features of this relief were formed by the action of glaciers of independent glaciations. However, no conclusions can be reached concerning the age of the deposits. Attempts to relate the three glaciations to the general stratigraphic scale must await special stratigraphic investigations. -- Meteorol. and Geostrophys. Abstracts

SIP 22945

551.326.62(+3)

Galgerov, S. S.  
THE 25th ANNIVERSARY OF THE COMMENCEMENT OF THE WORLD'S FIRST POLAR DRIFTING STATION, SP-1. (K dvadtsatipiatletiyu nachala raboty pervoy v mire nauchnoissledovatel'skoy dreyfusishchey stanitsii SP-1; Text in Russian). Meteorologiya i Gidrologiya, No. 6:48-50 incl. map, June 1962. 1 ref.  
DLC, QC851.M27

The history is discussed of the work of the Soviet polar drifting stations since their inauguration in May 1937. A map is given showing the tracks of the various stations since that time. The nature of the observations carried out are described and many of the scientists involved in the work are named. -- Meteorol. and Geostrophys. Abstracts

SIP 22946

551.324.001.5(+535)

Khmaladze, G. N.  
GLACIAL RESEARCH IN THE CAUCASUS MOUNTAINS. (Glatsiologicheskie issledovaniya v gorakh Kavkaza; Text in Russian). Meteorologiya i Gidrologiya, No. 11:57-59, 1962. 17 refs.  
DLC, QC851.M27

There are about 1400 glaciers in the Caucasus region with an overall ice covered region of 1965 km<sup>2</sup>. The greatest proportion of these glaciers is concentrated in the region between the summits of the Elbrus and Kazbek. Glacier study has been going on for over a century. During the century 1887-1957, there was a general recession of the glaciers. Early research work gave much information on general characteristics but little was known about the particular characteristics of individual river basins. Research has been more systematic over the last 10 yr. Regular observations are carried out at a number of fixed observation posts, and especially in 3 glacial basins. In addition, several expeditionary surveys have been carried out, mainly in summer, on particular glaciers. A planned survey during 1959-65 is aimed at determining the extent of contemporary ice formation. Several surveys carried out in recent years on par-

ticular glaciers are noted. Water balance and snow cover studies, including avalanche investigations, are under way. -- Meteorol. and Geostrophys. Abstracts

SIP 22947

551.526.6:551.326.7(268)

Rezakov, G. S.  
HEAT CONTENT OF THE WATER OF KOLYMA BAY. (K voprosu o teplozapaske vod Kolymnskogo zaliva; Text in Russian). Problemy Arktiki i Antarktiki, No. 9:29-35 incl. tables, graphs, 1961.  
DLC, G575.L422

The timing of shipping in the region of the Kolyma River is connected with ice formation in Kolyma Bay and the heat content of its waters. A series of meteorological observations were made from the ice-breaker "Admiral Makarov" during Oct. 1959. The results of analysis and variations of actual and computed heat content data are tabulated. Computed data are approximate and are given with reference to variable factors affecting the heat content in waters of Kolyma Bay during Oct. -- Meteorol. and Geostrophys. Abstracts

SIP 22948

551.324.4(+726.1)

Noble, H. M.  
GLACIOLOGICAL OBSERVATIONS AT ADMIRALTY BAY, KING GEORGE ISLAND, IN 1957-58. Brit. Antarctic Survey Bull. No. 5:1-11 incl. illus., tables, graphs, maps, Jan. 1965. 7 refs.  
DLC, Unbound periodicals

Observations were made on Stenhouse and Flagstaff. Glaciers from March 3, 1957, to March 31, 1958. The Stenhouse is an outlet valley glacier with a 12° slope and a specific budget (budget/area) of -0.064 ± 0.11 m of water. The Flagstaff is a small glacier filling a cirque on the east side of Flagstaff Hill at the southern end of Keller Peninsula. It has a specific budget of -0.53 m of water. Accumulation, ablation, and movement observations for each glacier are tabulated. The results show that in recent times a general reduction occurred in the amount of ice on King George Island. Undernourishment prevailed for all glaciers during the IGY, accentuated for those glaciers not fed by the ice cap. Positions of the terminal ice cliffs of the tidal glaciers varied during the budget year 1957-58, depending primarily on sea water temperature. Along the south coast of the island calving from the snouts of glaciers terminating in the sea accounted for most of the ice lost from the island's supply. -- GAD

# CRRRL BIBLIOGRAPHY

SIP 22949

551.324.28(+729)

Ardus, Dennis A.  
MORPHOLOGY AND REGIME OF THE BRUNT ICE SHELF AND THE ADJACENT INLAND ICE, 1960-61. Brit. Antarctic Survey Bull. No. 5:13-42 incl. illus., tables, graphs, maps, Jan. 1965. 32 refs.  
DLC, Unbound periodicals

Geological investigations were made during Jan. 1960-Feb. 1962, in the vicinity of Halley Bay Station. The Brunt Ice Shelf and Riser-Larsen Isen form an ice shelf about 75,000 km<sup>2</sup>, whose extent is largely due to the protection afforded by the McDonald Ice Rumples. Large depressions are actively forming within the ice shelf as a result of divergent flow. The slope of the inland ice has a great influence on the morphology of the ice shelf. The rift separating the shelf from the inland ice, and the formation of icebergs are attributed to the steepness of the slope of the inland ice. Stake and pit measurements show uniform accumulation except locally in depressions near the ice front, and in undulations. At Tottanfjella, east-facing slopes are usually bare, while ice slopes are heavily glaciated. At Halley Bay the net accumulation is considered to be representative of the true precipitation, and the mean annual measurements (38.99 cm water) for 1945-61 are probably a good measure of the precipitation over the whole area. -- GAD

SIP 22951

551.328.8(+531.4)

Liser, I. A.  
ANALYSIS OF A CASE OF EXTREME ICE THICKNESS. (Analiz sluchaya ekstremal'noy tolshchiny l'da; Text in Russian). Meteorologiya i Gidologiya, No. 1:45-46 incl. table, Jan. 1965.  
DLC, QC 851.M27, 1965

Results of ice thickness measurements during the winter of 1955-56 along the Yenisey R., 24 km upstream of Krasnoyarsk and 2 km below the mouth of the Nana R. are tabulated and show that the mean ice thickness was between 105 and 155 cm and the maximum value between 125 and 265 cm. The maximum thickness normally observed is usually little more than 1 m. The exceptional 190 to 265 cm thickness observed during the typical winter of 1955-56 is explained by the occurrence of several heat waves, especially on Nov. 23rd when the temperature rose to 7°C. This caused edge-breaking of previously accumulated ice, mass packing, and sludge accumulation which remained at the point of greatest thickness until winter's end. Complete freezing of the river lasts more than 5 months. The climatic regime of the Yenisey R. area near Krasnoyarsk (long and severe winter with a low temperature of -40 to -45°C, mean temperature between -16 to -20°C, and maximum snow cover of 15 to 25 cm) is typical for Siberian rivers. -- VDP/FMM

SIP 22950 551.326.7:551.464:551.510.41:546.264  
(\*7)

Miyake, Y. and S. Matsuo  
A ROLE OF SEA ICE AND SEA WATER IN THE ANTARCTIC ON THE CARBON DIOXIDE CYCLE IN THE ATMOSPHERE. Papers Meteorol. Geophys. (Japan), 14(2):120-125 incl. table, graph, Sept. 1963. 12 refs.  
DLC, Orientalia Div.

According to an analysis of gas inclusions in Antarctic sea ice, the CO<sub>2</sub> content was 0.1 to 0.5 ml/kg at NTP [standard temperature and pressure]. On the other hand, Torii et al (1959) showed that the partial pressure of CO<sub>2</sub> in sea water is often as high as 6 x 10<sup>-4</sup> atmospheres. The amount of CO<sub>2</sub> which escapes from sea ice and sea water during the summer months is estimated. The results show that although the increase in the CO<sub>2</sub> concentration in the air as a result of this escaped CO<sub>2</sub> is small, the total amount of release for sea ice and sea water is 1.8 x 10<sup>13</sup> gm/yr and 1.2 x 10<sup>14</sup> gm/yr, respectively. These amounts are comparable to the rate of production from other sources whose importance in the geochemical cycle of CO<sub>2</sub> in the atmosphere has been well established. (Authors' abstract, modified)

SIP 22952

625.04:661.842

Koyama, M., and T. Takashi, Y. Kawai, and T. Kōsaka  
TEST ON FROST HEAVE SUPPRESSION OF CaCl<sub>2</sub>. (Enka karushiumu niyoru tōjō yokusei kōka ni kansuru jikken; Text in Japanese). Hokkaidō Kaihatsukyoku Doboku Shikenjo Geppō No. 133, 1-11, incl. diagrs., tables, June 1964. 4 refs.  
DLC, Orientalia Div.

Laboratory and field tests of frost heave suppression using 90% pure CaCl<sub>2</sub> in concentrations of 1 to 50% (dry weight) were made by mixing and by scattering on the road. In the laboratory, frost heave rates were 463, 103, 30 and 0%, respectively, for samples containing CaCl<sub>2</sub> concentrations of 0, 1, 2, and 3%. In samples containing 4 or 5% CaCl<sub>2</sub> no freezing occurred. In the field tests, 6 blocks of 3 m x 6 m road surface were used, CaCl<sub>2</sub> quantities from 0 kg/m<sup>2</sup> to 6 kg/m<sup>2</sup>. Frost heave rate, water content ratio, and dry density one winter later were not noticeably different in comparing the mixing and scattering procedure. It was found that CaCl<sub>2</sub> was effective even in small amounts but only for a short time. -- CST/FMM



# CRREL BIBLIOGRAPHY

SIP 22953

551.322:539.37(\*7)

Mellor, Malcolm and George Hendrickson  
**CONFINED CREEP TESTS ON POLAR SNOW.** Res. Rept. 138, U.S. Army Cold Regions Research and Engineering Laboratory, 8p. incl. tables, graphs, Feb. 1965. 8 refs.

CRREL files

Snow was sampled from various depths below the surface of the ice sheet at Byrd and Amundsen-Scott Stations, Antarctica. The samples were obtained either by sawing blocks from trench and tunnel walls or by coring with the CRREL hand auger. The creep specimens were introduced into their stainless-steel cylinders by "screwing" the saw-edged cylinders into larger sample blocks. The cylinders were standard CRREL snow-sampling tubes, lined with silicone grease to reduce friction and adhesion. The tubes were set vertically on a bench, and pressure was applied axially with a loose piston loaded by a guided yoke, deformations being read periodically from dial micrometers. The mechanics of creep is discussed and the data are tabulated and graphed with respect to temperature and density effects. At the lower densities, the compressive viscosities are in reasonable agreement with those deduced from depth-density profiles. It is suggested that at least part of the discrepancy may be attributed to the strain history of the snow. The creep tests suggest a functional relationship between viscosity and density different from that suggested by analyses of natural snow densification. (Authors' abstract)

SIP 22954

69:624.14:624.19(\*772)

Mellor, Malcolm and George Hendrickson  
**UNDERSNOW STRUCTURES: BYRD STATION, ANTARCTICA.** Tech. Rept. 138, U.S. Army Cold Regions Research and Engineering Laboratory, 38 p. incl. illus., table, graphs, diagrs., appendixes A-C, Feb. 1965. 14 refs.

CRREL files

Byrd Station consists of a network of shallow tunnels containing light, T-5-type, prefabricated buildings and other items of equipment. Some small buildings (e.g., aurora tower, balloon pavilion, rawin dome) are elevated above the snow surface on extensible columns. The tunnels were constructed by the "cut-and-cover" method. Electric power is generated by a diesel plant and distributed through overhead wires. Snow melter-produced water is piped to the quarters and galley. The buildings are heated mainly by individual oil-fired hot air systems. Only 1 vehicle access opening is maintained, and most hatches to the surface are closed. Data are given concerning tunnel deformation, floor levels and foundation settlement, temperature measurements, ventilation, and other tests. The appendixes discuss snow reinforcement tests, air permeability of snow and the ventilation of undersnow camps, and the thermal effects of water wells and sewage sinks. (Authors' abstract)

SIP 22955

551.578.486(52)

Miyajima, H.  
**AVALANCHES IN KUROBE RIVER BASIN.** (Kurobe-gawa no nadare; Text in Japanese). Seppyo, 25(2): 35-36 incl. maps, March 1963.  
 DLC, Orientalia Div.

Avalanches are discussed by dividing them according to the time of occurrence, such as, first-snow period (middle Nov.), coldest period (Jan.), and thaw period (March-April). Two avalanches which occurred during construction of power stations at Shiai Valley on Dec. 27, 1938 and at Asohara Valley on Jan. 9, 1940, both in the Kurobe River basin are briefly described.  
 -- CST

SIP 22956

551.578.486(52)

Shikano, F.  
**AVALANCHE AT BABAJIMA.** (Babajima no nadare saigai; Text in Japanese). Seppyo, 25(2):36-38 incl. maps, March 1963.  
 DLC, Orientalia Div.

Two avalanches occurred in the residential areas at Babajima Power Station on Dec. 21, 1961 and at Yanagawa Power Station on Feb. 10, 1956 in Toyama. At Babajima, 3 wings of living quarters, located on a 100-m long, 23° slope, part of a 1300-m long valley of 30-35° slope, were destroyed. A temperature rise of 10° C and subsequent lowering with a 40-cm snowfall resulted in an avalanche. At Yanagawa, by the Kurobe River, the quarters were in a valley of 40-45° slope. A sudden drop in temperature after two days at 3° C, causing an ice layer followed by a 150-cm snowfall, resulted in an avalanche. The damage was extensive due to the fact that buildings were dispersed and inadequately designed for lateral pressures. -- CST/FMM

SIP 22957

551.577:551.509.54(52)

Yamada, T.  
**WEATHER FORECASTING DURING SNOW SEASONS.** (Kōsetsuki ni okeru kishō yoshin ni tsuite; Text in Japanese). Seppyo, 25(2):38-45 incl. tables, graphs, maps, March 1963.  
 DLC, Orientalia Div.

Avalanches and other railroad hazards have occurred along the Hiraiwa Branch of the Kanazawa Railway which is located in the mountainous borders of Nagano, Toyama, and Niigata. The occurrences during 1952-1961; total snowfall, maximum snow depth, number of snow days, and temperatures in 1960 and 1961 are given. Freezing conditions, avalanches, snow and sleet occur at 995, 975, 980 and 977 mb pressure and temperature of -5, 5, 2 to -2, and 3-2° C respectively. The year 1961, characterized by atmospheric pressure above 990 mb and temperature lower than

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usual, was a heavy snow year with dry and fine-grained snow. Weather forecasts made twice daily at 8 a.m. and 4 p.m. have shown good results. -- CST/FMM

SIP 2295\*

624.144.53(52)

Nishita, M.  
SNOW REMOVAL ON ROADS IN TOYAMA PREFECTURE. (Toyamaken no dorō josetsu no genkyō; Text in Japanese). Seppyō, 25(2):45-51 incl. tables, graph, map, March 1963.  
DLC, Orientalia Div.

Removal of snow from roads during the winter of 1960-61 is reported in Toyama where the maximum snow cover depth exceeds 50 cm in Feb. and average Jan. temperature is below 0°C for over 3/4 of the area. Allocation schedules of snow removal facilities including 32 high-speed dump trucks and motorgraders (10 km/hr) and 20 low-speed bulldozers (3 km/hr) are tabulated. For 20 km, which included 16 important traffic intersections, roads were so narrowed and obstructed by falling snow from house-tops that mechanical operation was impossible. Snow along 556 km of road was removed in 1961. Snow removal is planned to increase to 726 km in 1965. -- CST/FMM

SIP 22959

624.145.8:621.311(52)

Inamatsu, T.  
ICE-JAM IN RESERVOIR OF POWER STATION. (Hatsudensho suiro oyobi shuuiyuchi no aisujamu ni tsuite; Text in Japanese). Seppyō, 25(2):54-55 incl. diagrs., March 1963.  
DLC, Orientalia Div.

In cold seasons, at hydroelectric power station sites, river ice in the upper reaches, aided by drifting snow and avalanches, freezes over. Ice flowing under the cover ultimately jams the water intake of the power station. Conventional sluices which are effective in containing ice during Dec. are crushed in the Feb.-March period of ice-flow. As a countermeasure it is proposed to use a 13-m long horizontal, screen-type sluice with an integral steel duct to channel water-flow to the intake. -- CST/FMM

SIP 22960

624.144.53(52)

Miyake, T.  
UNDERGROUND WATER PIPE FOR SNOW REMOVAL ON ROADS. (Dorō josetsu toshitenō shōsetsu paipu; Text in Japanese). Seppyō, 25(2):55-57, incl. illus., tables, March 1963. 4 refs.  
DLC, Orientalia Div.

At Nagaoka, underground water at a temperature of 15°C was used to warm the road surface and melt snow. Two types of pipe for carrying the water were used. Pipes 100 mm in diameter to conduct water from wells, 6.4 m to 7 m deep, were buried under the center line of the road and equipped with nozzles, 6 to 8 mm in diameter at 40-cm intervals. The height of the water jet was 70 cm and diminished to 20-30 cm with decreasing pressure. Pipes of 20 mm diameter for spring water were buried 10 cm under the road surface with nozzles at 25-cm interval and upward jet direction of 45°. It was found that 85 l/hr or 23.6 cc/sec of water was needed for 1 m². The method was effective even in the heavy snow of Jan. 30, 1963, when accumulation was 3.18 m and water equivalent, 2.3 - 4.3 mm/hr. -- CST/FMM

SIP 22961

624.144.4:625.3(\*50)

Pigulevskii, S.V. and A. P. Popovkin  
TRACK MAINTENANCE AND REPAIR. CONTROL OF SNOW DRIFTS. (Soderzhanie i remont puti. Bor'ba so snezhnymi zanosami; Text in Russian). p. 149-205 incl. graphs. (In: Ustroistvo i soderzhanie lesovoznykh zheleznikh dorog kolei 750 mm, Moscow, Goslesbumizdat, 1963).  
DLC, TF677.P5

Snowdrift conditions on railway lines in the USSR are classified into three categories depending on the height of road cuts. Cuts of 0.4 to 8.5 m get most snow drift. Various methods of control are in use: (1) Movable wooden fences 2 x 1.5 m and 2 x 2 m allow for mobility and by the use of high poles can be raised without replacement when snowdrifts reach considerable heights. (2) Permanent fences, 3 to 7 m high, although initially expensive, require only subsequent repairs. (3) Tree lines are the most usual and effective control. (4) Removal of grass and other material around the roadbed prevents snow accumulation. (5) Single and double track blade-plows of the "Norsorog" and similar types are used for snow drifts up to 1.5 m high. Use of rotary and blower-type snow plows avoids accumulation of the removed snow along the sides of the road bed. (6) Manual snow removal. -- VDP

SIP 22962

551.345:581.5(\*440)

Brown, R. J. E.  
SOME OBSERVATIONS ON THE INFLUENCE OF CLIMATIC AND TERRAIN FEATURES ON PERMAFROST AT NORMAN WELLS, N.W.T., CANADA. Res. Paper No. 236, Div. Building Res., Natl. Res. Council, Can. NRC 8213, 16 p. incl. illus., tables, graphs, map, Feb. 1965. 6 refs. (Also: Can. J. Earth Sci. vol. 2, p. 15-31, Feb. 1965)  
DLC, Tech. Rept. Collection

During the summers of 1959 and 1960, the influence of climatic and terrain features on permafrost was

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Investigated at Norman Wells, N.W.T. Five sites, all underlain by permafrost, were investigated. One was a Thornthwaite potential evapotranspiration site with a vegetation cover of Kentucky bluegrass growing on clayey silt. The four remaining sites included the various types of vegetation growing in the Norman Wells region. The tree growth was predominantly spruce with some tamarack. Sphagnum and other mosses, lichen, and sedge comprised the ground cover. The peat layer varied in thickness from 7 in to 2 ft and the mineral soil was predominantly clayey silt. At each site, measurements were made of evaporation (including evapotranspiration), net radiation at the ground surface, depth of thaw, and ground temperatures in the thawed layer and the permafrost. Although field conditions dictated the use of crude measuring devices, some quantitative information was obtained on the relative importance of these climatic and terrain features in the permafrost environment. Potential evapotranspiration was higher in the Kentucky bluegrass at the Thornthwaite site than in sphagnum and other mosses, lichen, and sedge at the other sites. The thaw depth under moss and lichen was less than in areas supporting other types of plant growth. Ground temperatures in the thawed layer and in the permafrost showed the same characteristics, being lower in the moss and lichen areas. (Author's abstract, modified)

SIP 22963 551.345:551.481.1(440)

Johnston, G. H. and R. J. E. Brown  
STRATIGRAPHY OF THE MACKENZIE RIVER DELTA, NORTHWEST TERRITORIES, CANADA. Res. Paper No. 235, Div. Building Res., Natl. Res. Council, Can. NRC 8280, 8 p. incl. tables, graphs, map, Jan. 1965. 10 refs. (Also: Bull. Geol. Soc. Am. 76(1):103-111, Jan. 1965)  
DLC, Tech. Rept. Collection

An investigation was carried out in April 1961 to determine the distribution of permafrost under and adjacent to a small lake. Using drilling methods, deposits were sampled to bedrock at a depth of 230 ft. Permafrost was not found in the hole bored under the center of the lake but it was found in the total thickness of deposits in 3 holes drilled within 50 ft of dense silty clay deposited on bedrock. Results of laboratory tests on the sediments sampled suggest that the lower portion of the dense silty-clay layer, which contains pebbles, is probably till deposited by the ice sheet that covered the area during the Wisconsin. The upper portion of the dense silty-clay layer, which contains no pebbles, was possibly deposited under glaciomarine or estuarine conditions. The sediments overlying the clay layer are of deltaic origin and were deposited by the present Mackenzie River and its post glacial predecessors. (Authors' abstract, modified)

SIP 22964 551.578.46:546.17:551.594.5(701)

Wilson, A. T. and D. A. House  
FIXATION OF NITROGEN BY AURORA AND ITS CONTRIBUTION TO THE NITROGEN BALANCE OF THE EARTH. Nature, 205(4973):793-794, Feb. 20, 1965. 4 refs  
DLC, Q1.N2

Snow was chemically analyzed at Amundsen-Scott Station to estimate the contribution of nitrate and nitrite from the atmosphere to the biosphere. It is thought that this nitrogen is the result of energy dissipation of aurora, airglow, and particulate bombardment. The South Pole was chosen because of the lack of nitrogen contamination from thunderstorm and human activities, and because it is within the auroral zone. Samples included freshly-fallen snow (Nov. 3, 1963), snow from the year 1962-63, and snow about 100 yr old. The nitrate plus nitrite content was nearly equal to the chloride content (0.027 ppm), in contrast to snow analyses from other areas less remote from the oceans. The annual infall of nitrogen as nitrate and nitrite at the South Pole is about 0.0045 lb/acre, too large a quantity to be the result of extraterrestrial sources alone. -- JFS

SIP 22965 551.324.6:082.2(136)

SYMPOSIUM OF OBERGURGL. OPENING ADDRESS-DISCUSSIONS - EXCURSIONS. Bull. Intern. Assoc. Sci. Hydrol. 8(2):50-108 incl. table, graph, diagr., June 1963. refs.  
DLC, GPRR

This section comprises the opening address (by P. A. Shumskif); discussions of the papers, and minutes of the Symposium on Variations of the Regimen of Existing Glaciers (Sept. 10-18, 1962); and the papers prepared for the small party which made a study tour Sept. 2-8, 1962, of several Swiss glaciers and other centers of interest to glaciologists. Shumskif points out that the most important problem in the study of glacier variations is to establish the regularities in the changes of the area covered by glaciers. The problem of glacier variations falls into 2 parts: (1) the glacio-meteorological problem, or the problem of the response of the rate of external mass and heat exchange to climatic changes and (2) the problem of the glacier reaction to the change of conditions at the glaciers external boundaries: the rate of external mass exchange, temperature, and stresses. Discussions on 37 symposium papers are presented. For abstracts on the individual papers presented at the symposium see SIP 21108-21131 and 22934-22940. See SIP 22966-22973 for the study-tour papers. -- BLE

# CRREL BIBLIOGRAPHY

SIP 22966

551.324(494)

Renaud, André  
GLACIERS IN THE ZERMATT REGION. (Les glaciers de la région de Zermatt; Text in French). Bull. Intern. Assoc. Sci. Hydrol. 8(2):109-112, June 1963, 11 refs.  
DLC, GPRR

A summary is presented of scientific investigations in the Zermatt region of Switzerland, including a discussion on the physical properties, mass balance, and movement of the glaciers with emphasis on the Gorner, Findelen, and Z'Mutt glaciers. -- BLE

SIP 22967

551.324:912(494)

Kasser, Peter  
NOTE ON THE NEW MAP OF THE ALETSCHE GLACIER. Bull. Intern. Assoc. Sci. Hydrol. 8(2):113-114, June 1963.  
DLC, GPRR

The new map series "Aletsch Glacier as of September 1957", a Swiss contribution to the IGY, will reproduce the entire drainage basin of the glacier at a scale of 1:10,000 with a contour interval of 10 m. The aerial photography and control for the map are described. The photogrammetry is now completed and a map has been produced which shows in detail the form of the glacier in Sept. 1957, the position of the glacier margin at the stage of maximum ice advance during the 19th century, and an especially pronounced retreat-stage of the last ice age, the Daun stage, which dates about 10,000 to 12,000 yr ago. During the Daun stage the terminus of the Great Aletsch Glacier probably lay somewhere near Brig. However, present-day glaciers are not relicts of the former ice age. A few years ago, the retreat of the Aletsch Glacier revealed a forest of stumps, from which it could be demonstrated that before the year A.D. 1200 the glacier was smaller for several centuries than it is now. The Aletsch Glacier survey of 1957 will provide the foundation for future investigations of the glacier. -- BLE

SIP 22968

551.324.433:551.321(494)

Kasser, Peter  
NOTE ON THE DETAILED ABLATION STUDIES OF 1959 AND 1962 ON THE GREAT ALETSCHE GLACIER. Bull. Intern. Assoc. Sci. Hydrol. 8(2):115-118 incl. table, June 1963. 3 refs.  
DLC, GPRR

Experiments were conducted on the Aletsch Glacier in Aug. 1959 and Sept. 1962 to find accurate methods for measuring ablation in a period of 1 hr or even 1/2 hr. In 1959 a suitable well defined small drainage basin was found on the glacier surface. The mean ablation of the area was observed for one week,

runoff was observed and established as a function of time throughout the week, and the ablation was distributed over the days and hours of the week according to the runoff. The results indicate that investigations of the correlation between ablation and microclimate in a small catchment basin of the glacier surface, whereby the ablation is determined by 3 independent methods, are promising. In 1962 experiments were conducted to test equipment in the development stage.  
-- BLE

SIP 22969

551.324.001.5(494)

Roethlisberger, H.  
THE RHONE GLACIER SURVEYS. Bull. Intern. Assoc. Sci. Hydrol. 8(2):119-121 incl. table, graph, June 1963. 3 refs.  
DLC, GPRR

From 1874 to 1915 one of the most complete surveys of the variations of a glacier yet made was conducted and published in a comprehensive report (Marcanton, 1916). The report reconstructs from various sources (e.g. moraines, descriptions, and old paintings and sketches) a reliable picture of the glacier's fluctuations for the last 3-1/2 centuries. Monthly observations of the snout position relative to fixed points in front of the glacier were conducted year round. Most of the movement studies in the ablation zone were conducted with painted rocks originally arranged in straight transverse lines, some of them numbered. Areal and linear data are given for the glacier. -- BLE

SIP 22970

551.324.51(494)

Haefeli, R.  
OBSERVATIONS AND MEASUREMENTS ON THE COLD ICE SHEET ON JUNG-FRAUJOCH. Bull. Intern. Assoc. Sci. Hydrol. 8(2):122, June 1963. 4 refs.  
DLC, GPRR

For a period of 10 yr (1950-1960), continuous measurements of displacement and deformation were made inside a system of ice tunnels and outside on the firn surface in the 50 m thick ice sheet on the Jungfrau-joch (3470 m) where the ice temperature lies below the melting point. The measurements provide an insight into the general behavior of a small cold ice sheet, its stresses and strains, the formation of water-filled crevasses, etc. Strain measurements along the axes of the ice tunnels have given useful information about the flow law of polycrystalline ice. Since the main temperature of the ice in the region lies between -1° and -3° C, the tunnel deformations provide a useful supplement to analogous measurements on circular tunnels in temperate glaciers. The observations demonstrate the existence of cold or polar glaciers in high alpine regions and indicate that

# CRREL BIBLIOGRAPHY

there must be many opportunities for research on cold glaciers in other high alpine regions. On the Jungfrauoch ice sheet movement is slow since there is no sliding on the permanently frozen rock bed and the apparent viscosity of the ice is less than that in a temperate glacier. Some data are given on tunnel conditions, ice overburden, displacements and temperatures. -- BLE

Vernagt and Goslar Glaciers and the Hintereis and Kesseliward Glaciers. Maps of the Oetzal glaciers are discussed, past and recent investigations in the area are summarized, short descriptive notes are given on the 17 local glaciers, and data (exposure, area, average height, and snout altitude) are tabulated for the largest glaciers in the Central Oetzal Alps. -- BLE

SIP 22971

551.332.56(494)

Haceli, R.  
NOTE ON THE HISTORY OF THE STEINGLETSCHER LAKE. Bull. Intern. Assoc. Sci. Hydrol. 8(2):123-125, June 1965.  
DLC, GPRR

The formation of the lake began 25 yr ago (about 1937) as a result of the recession and the special morphological conditions of the Steingletscher whose surface area is presently about 8 km<sup>2</sup>. An aerial picture taken in 1940 shows the lake in its embryonic stage. In July 1956 the lake level was 1938 m above sea level and the lake volume was 2.2 million m<sup>3</sup> with a maximum depth of 25 m. A flood with a maximum lake inflow of 11 m<sup>3</sup>/sec developed during a night of thunderstorms on July 29-30, 1956, when construction work was in progress to regulate the lake level at the outlet. Within a few hours the outlet level sank by 5.5 m and partial drainage of the lake increased the flood by 700,000 to 800,000 m<sup>3</sup>. Changes in the lake during the last 5 yr (1956-61) are summarized. -- BLE

SIP 22973

551.32:016(436)

Rudolph, R.  
GLACIOLOGICAL BIBLIOGRAPHY OF THE CENTRAL OETZTAL ALPS. Bull. Intern. Assoc. Sci. Hydrol. 8(2):132-139, June 1963.  
DLC, GPRR

This list in 3 parts consists of about 340 references. Two thirds of the entries are papers and summary reports; the remaining third are brief reports on glaciological investigations carried out on the Hintereis, Vernagt, and Hochjoch Glaciers (profiles, deep borings, etc.), and reports on annual glacier measurements made on behalf of the German and Austrian Alpenverein in the Central Oetzal Alps. -- BLE

SIP 22972

551.324:551.4(436)

Rudolph, R.  
A BRIEF ACCOUNT OF THE GEOGRAPHY OF THE CENTRAL OETZTAL ALPS WITH SPECIAL REFERENCE TO ITS GLACIOLOGY. Bull. Intern. Assoc. Sci. Hydrol. 8(2):126-131 incl. table, June 1963.  
DLC, GPRR

This is the most heavily glacierized part of the Eastern Alps. The ice covered area is about 160 km<sup>2</sup>. Above Obergurgl at about 2200 m, the steep eastern wall of the valley gives way to a broad plateau on to which the tongues of the Gaisberg, Rotmoos, and Langtaler Glaciers descend. At greater heights the sudden change in slope at the edge of the cirques gives rise to many ice falls (Gepatsch, Taschach, and Mittelberg Glaciers). Early references to the behavior of the glaciers in the Oetzal are summarized with emphasis on the Vernagt Glacier. Contemporary reports indicate that the maximum postglacial advance occurred in the middle of the 19th century. After the last advance between 1850 and 1880 the glaciers slowly retreated with minor advances or stationary periods about 1870, 1890, and 1920. The loss of ice has accelerated in the last 35 yr. The Vernagt Glacier has retreated 4 km since 1850. Many previously coalesced glacier snouts have separated, e.g., the

SIP 22974

551.324:912(45)  
551.324(083.2)(45)

Nangeroni, G. and M. Vanni  
THE ACTIVITIES OF THE ITALIAN GLACIOLOGICAL COMMITTEE ON THE OCCASION OF THE INTERNATIONAL GEOPHYSICAL YEAR (IGY). Bull. Intern. Assoc. Sci. Hydrol. 8(3):97-101, Sept. 1963. 6 refs.  
DLC, GPRR

As a contribution to the IGY, the Italian Glaciological Committee prepared the Register of Italian Glaciers existing in 1957-58, and made complete topographical and depth surveys from 1952 to 1960 of a group of glaciers in various Alpine fields and of the Calderone Glacier in the Gran Sasso. The register, which consists of 4 volumes, was prepared by (1) compiling a card index of each existing glacier and of those which disappeared within the last 50 yr, based on existing bibliography, cartographic and photographic documentation, and direct observations made in the summers of 1957 and 1958, and (2) publishing the data collected on the cards. Of the 1028 glaciers indexed, 190 have disappeared in the last 20 yr. The methodology of the cartographic surveys is summarized for each of the glaciers. -- BLE

CRREL BIBLIOGRAPHY

SIP 22975

551.578.42:551.321.7(45)

Morandini, G.  
TEN YEARS' OBSERVATIONS ON SNOW IN ITALY  
1951/52 - 1960/61. Bull. Intern. Assoc. Sci. Hydrol.  
8(3):101-108, Sept. 1963. 58 refs.  
DLC, GPRR

Work organization and methodology are discussed, and the pilot stations used to measure snow depth, density, and temperature in Italy are listed. It is doubtful that accurate conclusions can be reached from the variable results; however, a correlation has been established between snow characteristics and stream flow, especially at the Lago della Rossa and Lago Golliet pilot stations. Results also show that the water equivalent of snow can be determined by measuring the ability of the snow to absorb gamma rays emitted by a radioactive cobalt plate. -- BLE

0.2 and 2.0 cps from the bottom of relatively shallow ice-covered seas show a line structure which indicates that vertical resonances occur within layers bounded at depth by the Mohorovičić discontinuity. The line structure appears with most clarity when recognizable transients are excluded. Under these quasi-stationary noise conditions, measurements of pressure spectra indicate that the seismic noise of the observed level can be generated by a vertical bobbing of the ice field as a whole. (Authors' abstract)

SIP 22976

551.322:535.37

Bachasson, Bernard and Alphonse Chaillou  
THERMOLUMINESCENCE OF ARTIFICIALLY DEFORMED ICE. (Thermoluminescence de la glace déformée artificiellement; Text in French). Compt. rend. 269(6):1709-11 incl. graphs, Feb. 8, 1965. 2 refs.  
DLC, Q46.A14

Previous studies have shown that the luminescence curve produces two peaks whose relative amplitudes depend on the origin of the ice. The present ultraviolet ray (3655Å) study shows that the ice produces up to four peaks of luminescence. The number, position, shape, and relative height of the peaks in each of the curves presented vary with the ice studied. For the homogeneous specimens the curves can be classified into three groups. In the first, a wide peak is produced comprising two or three maximums, the two extremes occupying positions around -165° C and -135° C. At temperatures lower than -100° C the second curve is similar to the first; but at -75° C a secondary peak appears lower than the preceding one. Curves of the third group contain one more supplementary peak in the vicinity of -190° C; the two consecutive peaks correspond to the extreme maximums of the first-group curves, and the peak at -75° C in the second group is also present in the third. -- GAD

SIP 22978

551.326.7(\*613)

Lunde, Torbjørn  
SEA ICE IN THE SVALBARD REGION 1957-1962.  
Norsk Polarinstitutt, Årbok 1962, p. 24-34 incl. tables, maps, Oslo, 1963. 7 refs.  
DLC, G575.078

The meteorological and oceanographic factors significant for the ice conditions in the Svalbard region are described and the position of the ice edge is given for June, July, and Aug. 1957-62. Using Lebedev's formula for ice accretion and Zubov's formula for the wind drift of ice, good agreement is found between the calculated ice thickness and the ice transport east of Spitsbergen and the ice conditions on the east, south and west coasts. The broad features of the distribution of the ice are well explained by studying winter air temperature, winter precipitation, and air pressure gradient. If necessary information on these factors, as well as detailed and frequent information on the ice conditions, could be obtained ice prognoses could also be given in broad terms. To give more reliable and detailed forecasts, it would be necessary to establish formulas especially for the Svalbard region. This would require thorough investigations of the ice-forming, ice-transporting, and ice-destructive factors. -- BLE

SIP 22977

551.463.2:551.326.7(\*3)

Milne, A.R. and S. R. Clark  
RESONANCES IN SEISMIC NOISE UNDER ARCTIC SEA-ICE. Bull. Seismological Soc. Am. 54(6):1797-1809 incl. table, graphs, diags., map, Dec. 1964. 12 refs.  
DLC, QE531.S3

Spectrograms of underwater seismic noise between

SIP 22979

551.336(\*58)

Liestøl, Olav  
LATE PLEISTOCENE GLACIER ADVANCE AT HARDANGERJØKULEN. (Et seneglacialt brefframstøt ved Hardanger jøkulen; Text in Norwegian with English abstract). Norsk Polarinstitutt, Årbok 1962, p. 132-139 incl. illus., graph, maps, Oslo, 1963. 6 refs.  
DLC, G575.078

Moraine ridges in the northwest part of Hardanger-vidda in southern Norway indicate a glacier re-advance in late glacial time. A snow line of 1550 m is computed which corresponds either to a summer temperature of 1.2° C below present or winter accumulation 600 mm higher than present. (Author's abstract)

SIP 22980

061.6:5:91(091)(+58:2)

Gjelsvik, Tore  
THE ACTIVITIES OF NORSK POLARINSTITUTT IN  
1962. Norsk Polarinstitut, Årbok 1962, p. 180-184,  
Oslo, 1963.  
DLC, G575.078

Expeditions to Svalbard carried out work in hydro-  
graphy, topography, geology, paleobotany, geo-  
physics, and biology and investigated ice conditions  
in the Svalbard waters. Oil prospecting was done by  
a private firm from Norway, and the U.S. and by a  
Russian expedition. Eight foreign scientific expedi-  
tions visited Svalbard. South Africa and Russia main-  
tained separate scientific stations during the winter in  
Dronning Maud Land, Antarctica. In May, Liestøl  
undertook mapping of Nigardsbreen in Norway, while  
Lunde continued the glaciological investigations of  
Storbreen in Jotunheimen. Dybvadskog studied  
glacier flow on Storbreen and Hisdal surveyed the  
front of Bondhusbreen (Folgefonna). Information is  
given on the preparation of data (charts, maps, etc.)  
from Svalbard and Antarctica. -- BLE

SIP 22981

551.578.46:537.22

Bent, R. B. and W. C. A. Hutchinson  
ELECTRIC SPACE CHARGES OVER MELTING SNOW  
ON THE GROUND. J. Atmospheric and Terrestrial  
Phys., 27(1):91-99 incl. tables, graphs, Jan. 1965.  
12 refs.  
DLC, QC801.J6

Records of space charge concentration and potential  
gradient over a melting snow cover indicate an aver-  
age concentration of 5500 negative elementary charges  
/cm<sup>3</sup> within the first meter above the ground, with a  
wind speed of 10 m/sec and an average of 770 posi-  
tive charges/cm<sup>3</sup> between 1 and 21 m. The upper  
positive space charge is accounted for by the blowing  
of snow on adjacent high land. The lower negative  
charge in the air near the ground, persisting in spite  
of the wind, can be explained if a separation of  
charge occurs at the surface, the positive charge re-  
maining on the melting snow. (Authors' abstract)

SIP 22982

551.578.42:551.321.7(931)

Gillies, A. J.  
REVIEW OF SNOW SURVEY METHODS, AND SNOW  
SURVEYS IN THE FRASER CATCHMENT, CENTRAL  
OTAGO. J. Hydrology (New Zealand), 3(1):3-18 incl.  
illus., map, June 1964. 9 refs.  
DLC, Unbound periodical

The main reasons for snow studies (completion of  
precipitation records, flood forecasting, consumptive  
use, and catchment standardization) are discussed,  
and details are given concerning snow storage gages,  
ground sampling, aerial inspection, photographic

methods, and gamma-radiation absorption counters.  
In the Fraser catchment in New Zealand, a semi-  
circular snow course was established which could be  
inspected from the air if necessary. The observa-  
tional results in this area showed that (1) under sub-  
antarctic conditions, present snow gage shield  
designs are not effective; (2) the most satisfactory  
snow gage for less exposed sites would be the ele-  
vated C-type gage with added features; (3) no substi-  
tute exists for snow-course sampling; and (4) aerial  
inspection with photographs is the most efficient  
method of observing snow-depth variations and the  
extent of snow cover. Insufficient work has been done  
on this catchment to determine whether the equivalent  
results can be obtained by sampling at only one site.  
-- BLE

SIP 22983

551.463.2:551.326.7(+3)

Milne, A. R. and J. H. Ganton  
A STATISTICAL DESCRIPTION OF NOISE UNDER  
SHORE-FAST SEA ICE IN WINTER. Rept. 65-1,  
Pacific Naval Lab, Defence Res. Board (Can.), [23]p.  
incl. graphs, diagrs., map, Jan. 1965. 6 refs.  
DLC, Tech. Rept. Collection

Ambient noise under shore-fast ice in mid-winter is  
generated at the surface by wind action as well as by  
mechanical cracking caused by declining air tempera-  
tures. An attempt has been made to relate field  
measurements of underwater noise to the sources of  
the noise by means of a geometrical model of the  
environment. This enabled relationships to be ob-  
tained between the noise spectral density and the co-  
efficient of excess at an omnidirectional hydrophone.  
(Authors' abstract)

SIP 22984

551.324.4:551.48(+58)

Østrem, Gunnar  
GLACIO-HYDROLOGICAL INVESTIGATIONS IN NOR-  
WAY. J. Hydrology (Amsterdam), 2(2):101-115 incl.  
illus., table, graphs, maps, 1964. 12 refs.  
DLC, Unbound periodical

In Norway mass balance is studied on several glaciers  
by measuring accumulation (total income) and ablation  
(total loss) on the entire glacier surface. By conduct-  
ing such measurements several times during the year,  
information is obtained on the rate of accumulation  
during the winter and the variations in ablation rate  
during the summer. The observational methods and  
equipment are described and data are given. Informa-  
tion is given on the glaciers acting as long-term  
reservoirs, the relation between melting and summer  
temperature, variations in mass balance related to  
climatological conditions, the mapping of glaciated  
areas in Norway, and the correlation between accu-  
mulation on glaciers and the snow accumulation maps.  
-- BLE

# CRREL BIBLIOGRAPHY

SIP 22985

551.578, 7.551, 501, 81

Herman, Benjamin M.  
**MULTIPLE SCATTER EFFECTS ON THE RADAR RETURN FROM LARGE HAIL.** J. Geophys. Res. 70 (5):1215-1225 incl. diagr., graphs, March 1, 1965, 16 refs.

DLC, QC811.J6

A modified form of the equation of radiative transfer is solved numerically in order to estimate the effects of multiple scattering on the backscattered radar signal. The returned signal from a hypothetical hailstorm composed of spherical hailstones approximately 3 cm in diam. is computed by means of the transfer equation, and the result is compared with that computed for the same storm but utilizing the conventional equation which neglects all multiple scattering. Results for optical depth  $\tau = 0.48$  show that multiple scattering effects enhance the backscattered signal by about 30%. This correction increases with optical depth, and is probably quite significant for the larger hailstones. (Author's abstract, modified)

SIP 22986

629.139, 85:551, 324(\*57)  
 625.89:551, 578, 46(\*57)

Ager, B. H:son  
**SNOW ROADS AND ICE LANDINGS.** Tech. Paper No. 127, Div. Building Res., Natl. Res. Council (Can.), 9 p. incl. illus., tables, graphs, diagr., Aug. 1961, 19 refs.

DLC, Tech. Rept. Collection

The results are reviewed of investigations conducted in Sweden on the preparation and use of snow roads and ice landings. Regarding snow roads, the main area to which the experience might be applied in Canada is in the preparation in deep snow regions of the strip roads required for the primary transportation stage, suitable for horses and small tractors. The powered open-roller and the adaptation of the frame-steering principle to vehicles used for road preparation might be considered for this type of work. It is unlikely that the experience gained on snow road preparation can be applied to the construction of the truck-haul road needed for Canadian logging operations. The introduction of light, portable, screw or propeller pumps has contributed to a considerable reduction in the costs of flooding ice landings in Sweden, and comparable reductions are possible in Canada. Some of the Swedish snow compaction equipment might also be useful as a complement to existing Canadian equipment. (From author's summary)

SIP 22987

551.33:551, 324, 294(78:\*49)

Laird, Wilson M. and Samuel J. Tuthill  
**GLACIAL RESEARCH IN SOUTH-CENTRAL ALASKA.** Compass of Sigma Gamma Epsilon, 41(2):97-103, Jan. 1964. 50 refs.

DLC, TN1.C793

While preparing geologic maps of glacial sediments of 12 counties covering about 16,000 mi<sup>2</sup> in North Dakota, a broad band (50 x 300 mi) of glacial drift deposit from stagnant glacier ice was discovered. The discovery suggests that the Wisconsinan glacier in North Dakota had a temperate aquatic environment on a wide band of its terminus. In order to understand the sediments of North Dakota more fully, the Martin River Glacier (50 air miles east of Cordova, Alaska) was studied during the field seasons of 1962 and 1963. The study included biology, chemistry, and limnology in addition to geology and paleontology. The results of the studies will be published over a period of several years in various geological and biological journals. -- BLE

SIP 22988

551.32:37:551, 321:528(\*49)

Eagan, Christopher P.  
**RESUME OF THE 1962 FIELD SEASON OF THE MICHIGAN STATE UNIVERSITY GLACIOLOGICAL INSTITUTE, JUNEAU ICEFIELD, ALASKA.** Compass of Sigma Gamma Epsilon, 41(1):61-69 incl. illus., map, Nov. 1963.

DLC, TN1.C793

The institute was initiated in 1961 to offer a combination of instruction and research opportunities to students interested in glaciology and related fields. The studies are primarily concerned with present and former glaciation of the Juneau Icefield. This paper discusses the facilities and logistics, the academic program and instructional staff, and the field projects. Observations were made near the terminus of the Mendenhall Glacier of surface velocity by means of a series of movement stakes embedded in deep holes. Lichen development was studied in the Mendenhall Valley to determine the feasibility of using lichen growth rates as an indicator of the date of recession of ice from bedrock surfaces. On July 15, a new field site was established at 5280 ft on the Mendenhall crestral névé, about 15 mi from the terminus. A 20-ft pit was dug in the firn, ablation measurements were made, and 5 test holes were drilled. The principal glaciological project of the season was a regional survey of firn-pack depth characteristics of Taku-Mendenhall--Llewellyn composite névé. Boundaries were determined between the snow accumulation of succeeding years, ram hardness was measured, and a supplementary study involved the measurement of englacial temperatures at 3 sites of the Taku-Llewellyn crestral névé. -- BLE

SIP 22989

551.4(\*3)

Gorbatskiy, G. V.  
**ARCTIC POLAR REGIONS.** (Severnaya pol'arnaya oblast'; Text in Russian). Leningrad, Izd-vo Leningradskogo Universiteta, 1964. 233 p. incl. maps, tables, diagrs. 312 refs.

DLC, Slavic unclass.



# CRREL BIBLIOGRAPHY

This general physico-geographical study of the Arctic regions gives at the beginning of each chapter an overall picture of the problem and continues with a description of the local characteristics for each area. Ten chapters review the following topics: 1. Polar landscapes, boundaries, and zonal distribution of the Arctic regions. 2. Bottom topography, currents, ice cover, and ice drift and distribution in the Arctic Ocean. 3. Climate, radiation, air moisture, cloud cover, and precipitation. 4. Permafrost, solifluction, weathering, erosion and polar-river regime. 5. Contemporary regional glaciation. 6. Geological structure and Pre-Quaternary history of the land. 7. Quaternary period. 8. Terrain features. 9. Soil and vegetation cover. 10. Animal life. -- VDP

SIP 22990

624.139.2:624.15(\*50)

Bondarev, P. D. and V. P. Ushkalov  
SPECIAL FEATURES IN DESIGNING AND BUILDING FOUNDATIONS ON FROZEN GROUND. (Osobennosti proektirovaniia i ustroistva fundamentov v usloviakh merzlykh gruntov; Text in Russian). Moscow, Izd-vo literatury po stroitel'stvu, 1964, 151 p. incl. illus., tables, maps, graphs, diagrs. 68 refs.

DLC, Slavic Unclass.

Maps show the general distribution of frozen ground in the USSR in 4 zones: the arctic, the sub-arctic, the moderately cold, and the southern. The climatology, engineering geology, and permafrost conditions are described and the most effective methods of building foundations recommended. Method 1 disregards the frozen state of the ground. Method 2 requires the preservation of the permafrost. Method 3 allows thawing during and after construction, and Method 4 requires pre-thawing. Methods of constructing water lines, sewers, other subterranean pipe lines, and roads are also considered. In the arctic and sub-arctic zones Method 1 is generally applied; in the moderately cold zone, depending on local conditions, all four methods are possible; in the southern zone, Methods 3 and 4 are usually applied, but under favorable ground conditions Method 1 can be used. The experience accumulated in foundation construction in various areas (Vorkuta region, Lake Baykal region, Far East, Okhotsk Sea Coast, and Siberia) is analyzed. Methods for designing foundations by deformation analysis; for calculating the depth and rate of ground thawing; the amount and rate of foundation settling and heaving force are offered and examples are given. -- VDP

SIP 22991

551.322:523.42

Dauvillier, Alexandre  
PLANETARY ALBEDOS AND GLACIAL PERIODS. THE VENUS GLACIATION. (Albedos planétaires et périodes glaciaires. La glaciation de Vénus; Text in French). Compt. rend. 256(4):836-838, Jan. 21, 1963, 8 refs.

DLC, Q46.A14

Venus is the seat of a permanent glaciation by reason of its high albedo due to its strong auroral activity and the low temperatures of its ionosphere. The Venus albedo is nearly 0.80 and since the solar flux is 1.81 times greater, the planet receives at its surface 40% less radiation than the Earth. Venus thus absorbs a little more radiation than Mars where the equatorial temperature rises only temporarily, around midday, above the freezing point. Hence, the oceans on Venus remain frozen since the planet's origin. The author shows how this glaciation accounts for observational data. The temperature of the cloud layer is about -40° C; it remains quasi unchanged during the entire rotation period. The ionosphere of Venus presents an activity comparable to that of the Earth and the existence of the auroral light on the dark hemisphere involves the existence of a magnetic field and accounts for the persistence of the ionosphere during the night. This superglaciation accompanied with an invariable temperature gives the planet a dull and monotonous solar aspect under a dark and veiled sky; however, it does not rule out the possibility of an atmospheric circulation between the equatorial and polar regions. -- Meteorol. and Geostrophys. Abstracts

SIP 22992

551.324.24:53(084.3)(\*7)

American Geographical Society of New York  
ANTARCTIC MAP FOLIO SERIES. FOLIO 2, PHYSICAL CHARACTERISTICS OF THE ANTARCTIC ICE SHEET. 1964, 10 p. incl. illus., tables, graphs, app., and portfolio of maps and photographs. 40 refs.

DLC, G3100.A4

The most easily measured parameters of Antarctic glaciology are presented in the form of maps. These are: surface elevations, ice thickness, average annual surface temperatures, average annual snow accumulation, near-surface densities, and data obtained from pits and cores. The latter are shown on three sheets of diagrams and ice photographs which summarize the results of studies at 10 stations. The appendix lists oversnow traverses, beginning with one ... 1908-09 in Victoria Land. The traverse routes are shown on a map. In addition to the text references, 147 data sources are listed from which the maps were compiled. -- JFS

SIP 22993

551.322:548.5

Sakai, Akira  
THE FROST-HARDENING PROCESS OF WOODY PLANT X. THE EFFECTIVE FROST-HARDENING TEMPERATURE IN TWIGS. (Mokuhon-rui no taitōsei zōdai katei X. Shi no taitōsei wo kōka-teki ni takameru ondo; Text in Japanese with English summary). Teion-kagaku (Low Temp. Sci.), Ser. B. No. 22:29-49 incl. illus., tables, graphs, 1964. 24 refs.

DLC, Orientalia Div.

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To clarify the mechanism of frost-hardening in woody plants, the seasonal fluctuations of frost-hardiness and the effect of hardening at temperatures ranging from 0 to -20° C were studied in twigs of willow and poplar during October to May. 1. The effect of hardening at various temperatures is as follows: -3° > -5°, 0° > -10° > Normal Control in autumn; -3° > -5° > -10° > N. C. > 0° in spring. Hardening at -3° C (in frozen state) was most effective in increasing the frost-hardiness of the twigs in all experiments. When twigs were hardened at effective temperatures, the effectiveness of hardening increased with the length of hardening period within certain limits. 2. The effect of frost-hardening, natural or artificial, differs considerably in the different tissues, the order of the effectiveness being as follows: outer parenchyma cells in the cortical tissue > inner parenchyma cells in the cortical tissue > pith ray, pith-pericycle tissue. 3. The optimum temperature for converting starch into sugar during frost-hardening was found to be -3° C in all of the twigs tested. In addition, the greater the effectiveness of the hardening treatment, the greater the rate of conversion from starch to sugar. From these results, the frost-hardiness of a twig is closely related to sugar content, especially in the xylem tissue. -- From author's summary

SIP 22994

551.579.2:551.321.7(43)

Henning, Hubert  
DETERMINATION OF THE WATER CONTENT OF A SNOW COVER AT THE FICHTELBERG METEOROLOGICAL STATION WITH THE AID OF GAMMA RADIATION. (Zur Bestimmung des Wassergehaltes einer Schneedecke unter Benutzung von Gamma-Strahlen an der meteorologischen Station Fichtelberg; Text in German with English summary). Z. Meteorologie, 17(7-8):229-333 incl. tables, graphs, 1964. 5 refs.

DLC, QC851.Z4

The water content of an old-snow cover was measured in March 1963 in the Fichtelberg (Erzgebirge) region of Germany to establish the suitability of an instrument using gamma rays for such tests. The instrument, designated the M-31 Gamma Snow Sonde (made in the USSR), was successfully used to estimate snow-cover depth in the Mittelgebirge area. For comparison purposes, the water content was also measured with the 50-cm<sup>2</sup> snow scale, Model CSSR. The results are presented and discussed. (From author's summary)

SIP 22995

551.578.46:531.754:551.579.2(43)

Rachner, M.  
THE SIGNIFICANCE OF SNOW-DENSITY MEASUREMENTS IN HYDROMETEOROLOGY. (Über die Bedeutung der Schneedichtemessung für hydrometeorologische Zwecke; Text in German with English summary). Z. Meteorologie, 17(7-8):234-239 incl. graphs, 1964. 30 refs.

DLC, QC851.Z4

The results are presented of snow-density measurements made during the 1960-61 and 1962-63 winters in Schlierke/Harz, Germany. The methodology is discussed and terms used are defined. With reference to past investigations in the U.S. and the USSR, the significance of the measurements for the prediction of water supply from the melting snow is discussed, and the physical changes of a snow cover and their causes are given. -- BLE

SIP 22996

551.322:548.51

Bigg, E. K. and G. T. Miles  
THE RESULTS OF LARGE-SCALE MEASUREMENTS OF NATURAL ICE NUCLEI. J. Atmospheric Sciences, 21(4):396-403 incl. table, graphs, maps, July 1964. 15 refs.

DLC, QC851.A283

A lengthy experiment in which simultaneous measurements of ice nucleus concentrations have been made continuously at 24 places in Eastern Australia is described. The main results show (1) no association of ice nuclei active at -15° C with terrestrial or volcanic dusts, (2) a close association with rainfall, (3) a tendency for high concentrations to occur in an east-west band or bands, and (4) a strong lunar control of ice nucleus concentrations. The implications of the results are discussed. (Authors' abstract)

SIP 22997

550.312:550.38(\*682)

Shaver, Ralph and Kenneth Hunkins  
ARCTIC OCEAN GEOPHYSICAL STUDIES: CHUKCHI CAP AND CHUKCHI ABYSSAL PLAIN. Deep Sea Res. 11(6):905-916 incl. graphs, maps, Dec. 1964. 14 refs.

DLC, GC1.D25

A bathymetric chart of the Chukchi Cap region was compiled with soundings obtained from Fletcher's Ice Island (T-3), as well as from other ice stations and from U.S. Navy icebreakers. New details of the Chukchi Cap are shown, including 2 submarine troughs on the southwest side. West of the Chukchi Cap, a small abyssal plain was found with a depth of 2230 m. This plain is connected through an abyssal gap with the deeper Canada Abyssal Plain. The prominent magnetic anomaly discovered during the drift of Station Charlie was crossed more recently by T-3 and by aeromagnetic flights. The continuity of the anomaly along the western and northern sides of the Chukchi Cap was further established by the new measurements. An interpretation was made of the anomaly as an expression of induced magnetization in basement rocks. The interpretation shows a basement ridge beneath the anomaly maximum at the edge of the Chukchi Cap. The Cap itself is interpreted as being underlain by a 12 km thickness of sediments. Both magnetic and gravity data were used for an interpretation.

# CRREL BIBLIOGRAPHY

tation of total crustal thickness along the same section. Crustal thickness ranges from 18-1/2 km beneath the Chukchi Cap to 32 km beneath the large basement ridge. (Authors' abstract)

SIP 22998

535.39:551.521.32

Averkiev, M. S.  
THE INFLUENCE OF AN UNDERLYING SURFACE ALBEDO ON DIFFUSED RADIATION. (Vliyanie al'bedo podstilaushchei poverkhnosti na rasselennuyu radiatsiyu; Text in Russian). Vestnik Moskovskogo Univ. Ser. 5, Geografiya, 20(1):37-41 incl. tables, graphs, Jan.-Feb. 1965. 1 ref.  
DLC, Unbound periodical.

Diffused radiation becomes a complex quantity to calculate in terms of earth and cloud albedo and correlation with the initial flux of the direct and dispersed radiation. Accumulated radiation dependent on cloud cover is expressed as  $A_n = 1/(1 - \alpha)$  in which  $\alpha$  is the earth's albedo and  $\gamma$  equals scattered radiation returned to earth after secondary dispersion. Formulas for scattered radiation and the earth's albedo in terms of cloud height and surface area are also derived.  
-- VDP/FMM

SIP 22999

551.331

Bashenina, N. V.  
ON THE CONCEPT OF "GLACIAL EROSION." (O poniatii "lednikovaya ekzatsiya;" Text in Russian). Vestnik Moskovskogo Univ. Ser. 5, Geografiya, 20(1):58-62 incl. illus., Jan.-Feb. 1965. 10 refs.  
DLC, Unbound periodical

Recent research has shown that the mechanical action of ice in glacial erosion has been overrated. Ice motion is not uniform for all its parts, but depends on ice thickness linked with the slope of pre-glacial terrain features. This helps to explain the formations under glacier deposits such as the pre-glacial crust weathering on the Kola Peninsula, pre-glacial alluvia in Lapland, Mesozoic formations under the glacial formation near Moscow, and a sub-glacial peat horizon in Novaya Zemlya. The formation of longitudinal depressions and kettle holes sometimes in a chainlike order and filled by lakes is no more ascribed to the mechanical work of ice but to tectonic fractures, the role of the glacier being only to smooth existing terrain features. In mountain glaciers movement distribution limits the possibilities of glacier erosion: 1. Tongue ice does not move with an uniform velocity and at the valley ridge is stationary. Physical weathering and the upper layer ice movements cause the morainic chains. 2. The parts of the glacier tongue which move are in the center. 3. The lower layers of ice in the tongue move slowly. 4. The glacier straightens the valley slopes which have been eroded by weathering and more rapidly than the valley ridges. 5. The valley shoulders are formed during the gla-

cier growth. 6. The polished rocks on the shoulder and valley bottom are not always the result of mechanical ice grinding but of physical and chemical weathering taking place under the ice cover. -- VDP/FMM

SIP 23000

551.578.48:551.33

Krŭchkov, V. V.  
CONDUCTING SOIL INVESTIGATIONS WHEN STUDYING AVALANCHE DANGER ZONES. (Pochvennye issledovaniya pri izucheni lavinoopasnykh zon; Text in Russian). Vestnik Moskovskogo Univ. Ser. 5, Geografiya, 20(1):62-64 incl. illus., diag., Jan.-Feb. 1965. 3 refs.  
DLC, Unbound periodical

Geomorphological and botanical features are very useful for determining avalanche danger zones. Snow slides usually transport large amounts of elastic material which, after years of accumulation, appears as a characteristic terrain feature. At the same time the sliding snow destroys or drastically changes the vegetation aspect. For instance, in the Khibiny Mts. firs and old birches have disappeared from the conical avalanche slidepaths, only young birches remaining. Another special feature of the slidepath ground is high moisture or marsh. These features, however, may not be relied on entirely when determining avalanche danger zones because some slidepaths are active every winter, and others are dormant for decades and reforest themselves. In such cases age studies of the forestation should be made to determine soil profiles and to identify slidepaths. Clearly marked podzolic and illuvial horizons require some 500 to 1000 years to form. In the center of the avalanche slidepath, debris and fine sandy materials are accumulated, revealing only humus horizons. A developed illuvial horizon can be found on the slidepath borders. Podzolic soils begin in the fir and birch forest (of the Khibiny Mts) beyond the well-defined avalanche slidepath. Small areas of buried podzolic soil at a depth of 10 to 40 cm may occur by the slidepath edges under piedmont sediment. -- VDP/FMM

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